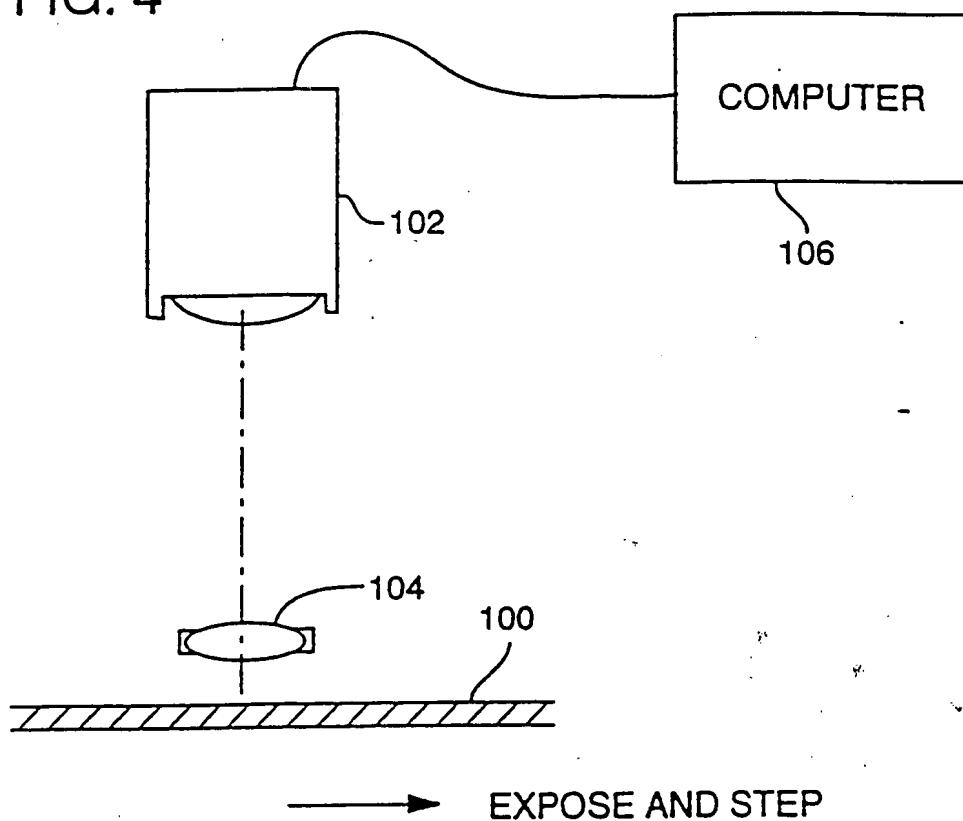


FIG. 4



0037455422-A412026

FIG. 1

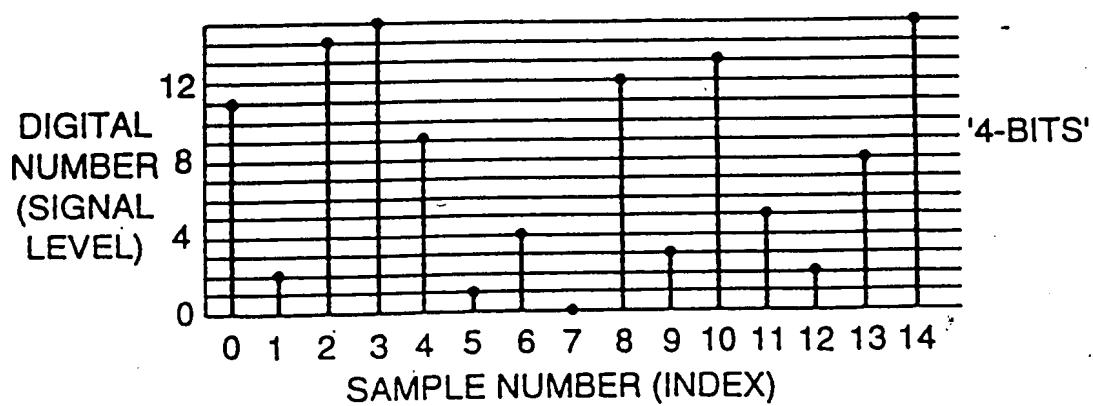
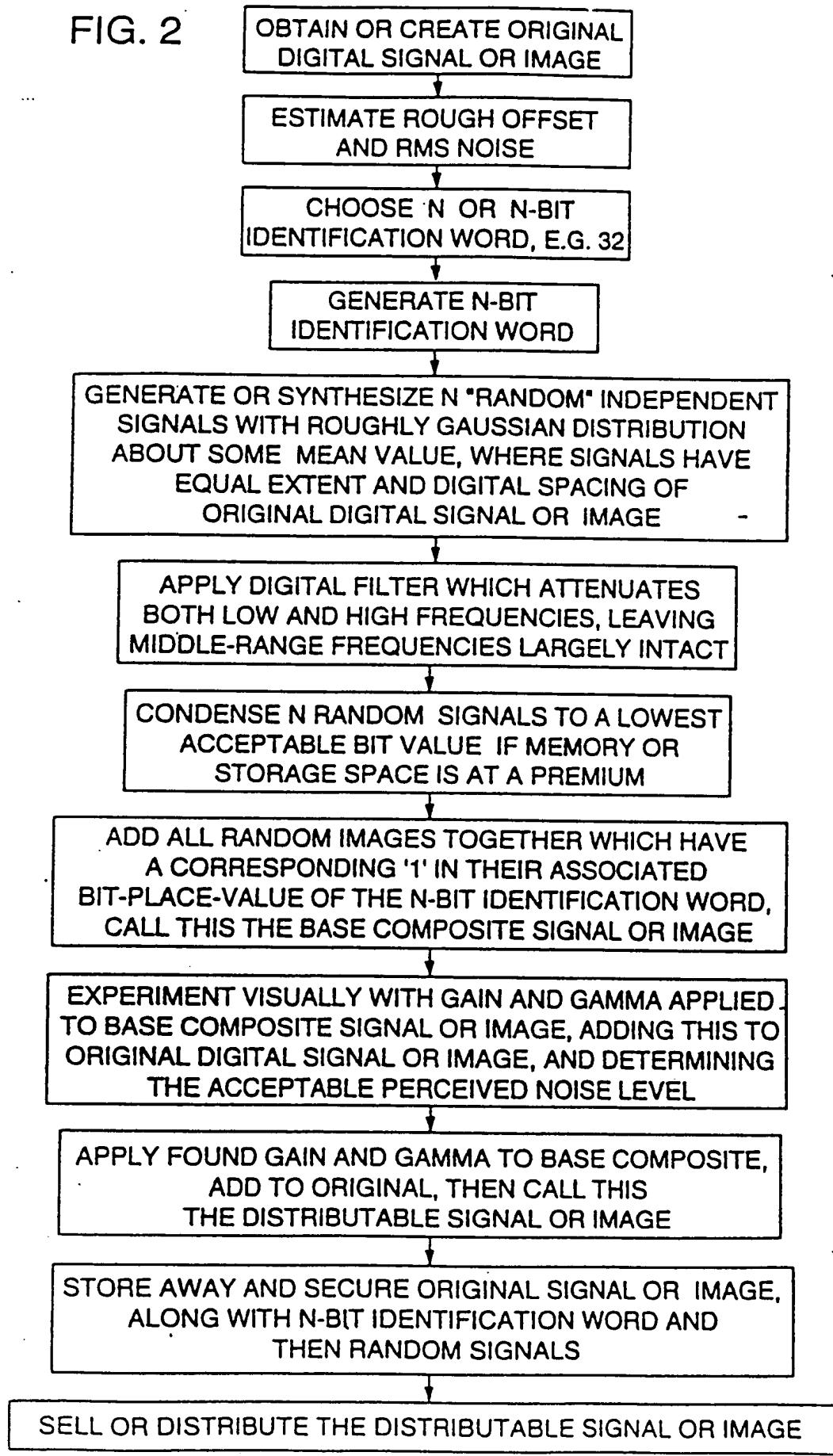
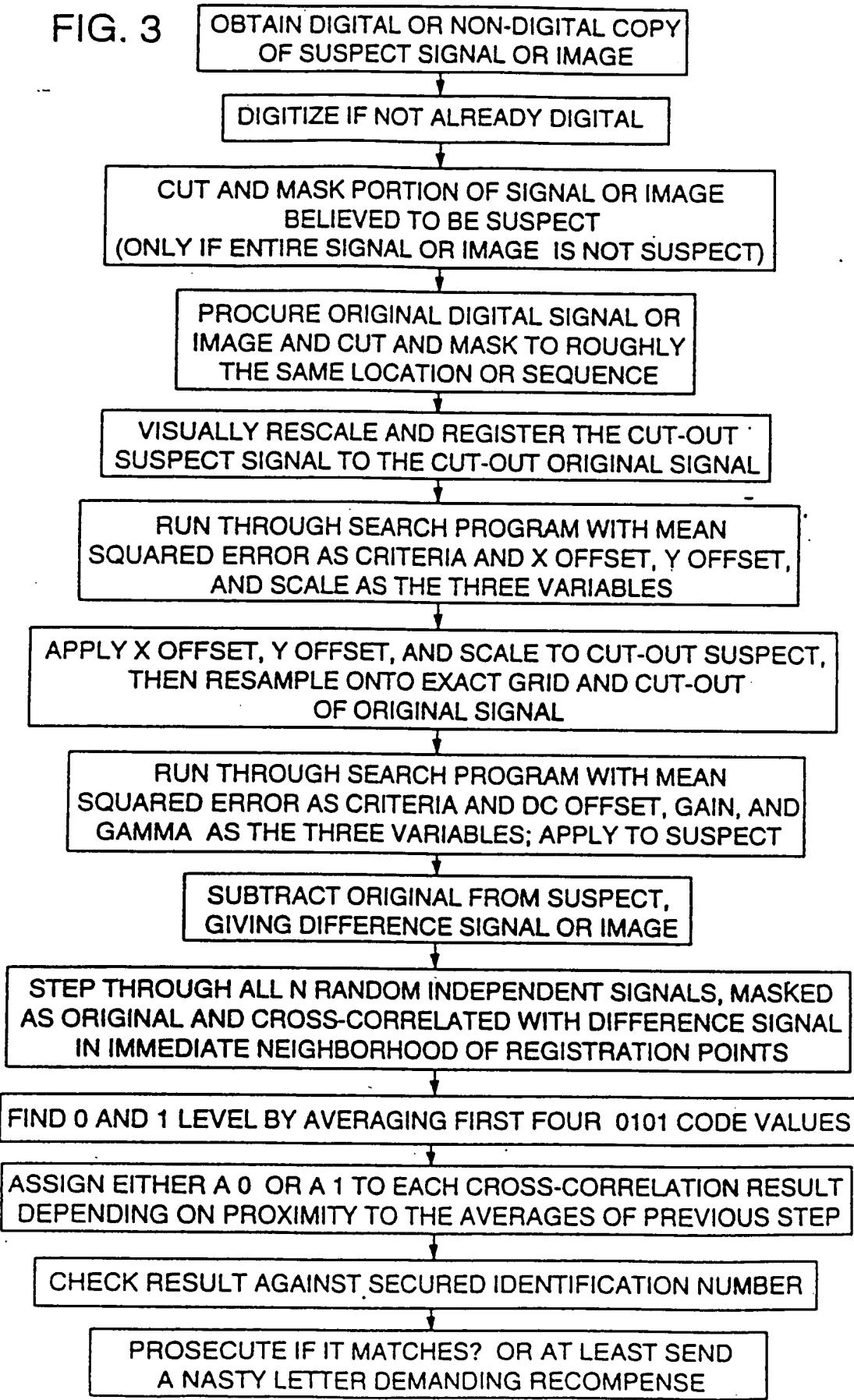


FIG. 2



08565432109876543210

FIG. 3



08746543 "444296

FIG. 5

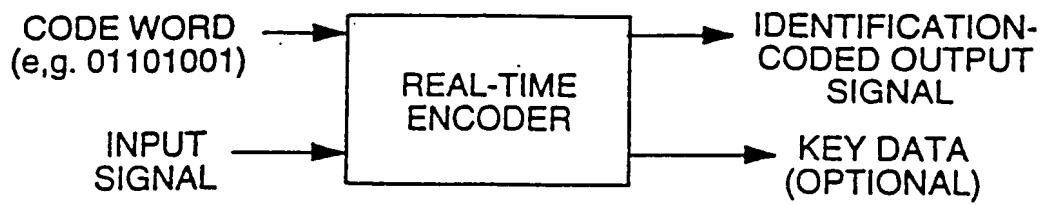
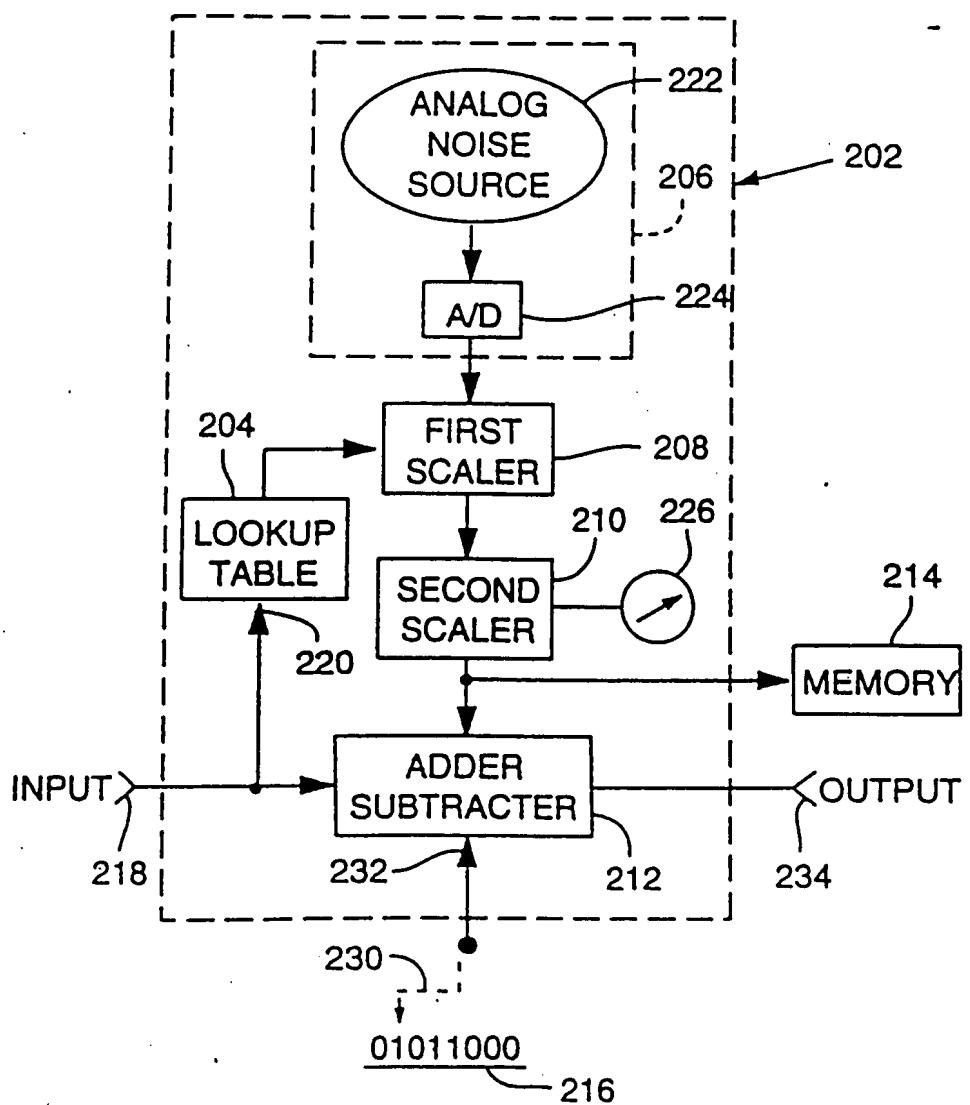


FIG. 6



0667455333-474205

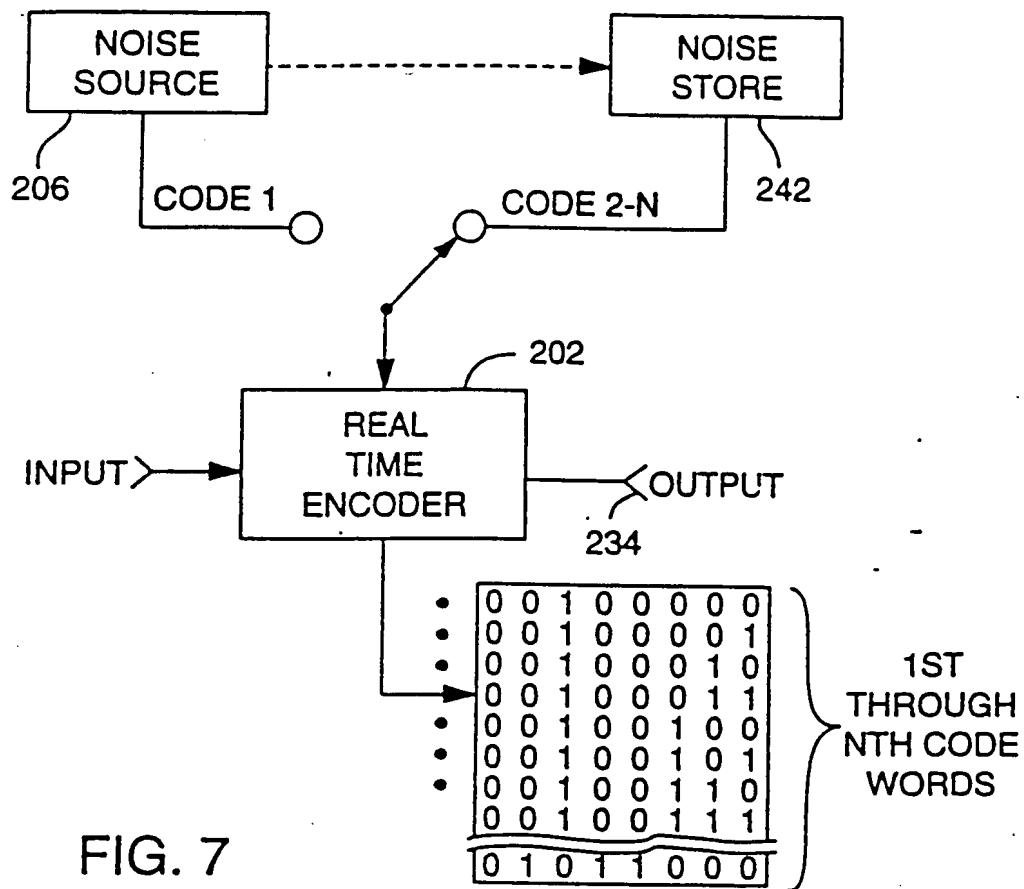


FIG. 8

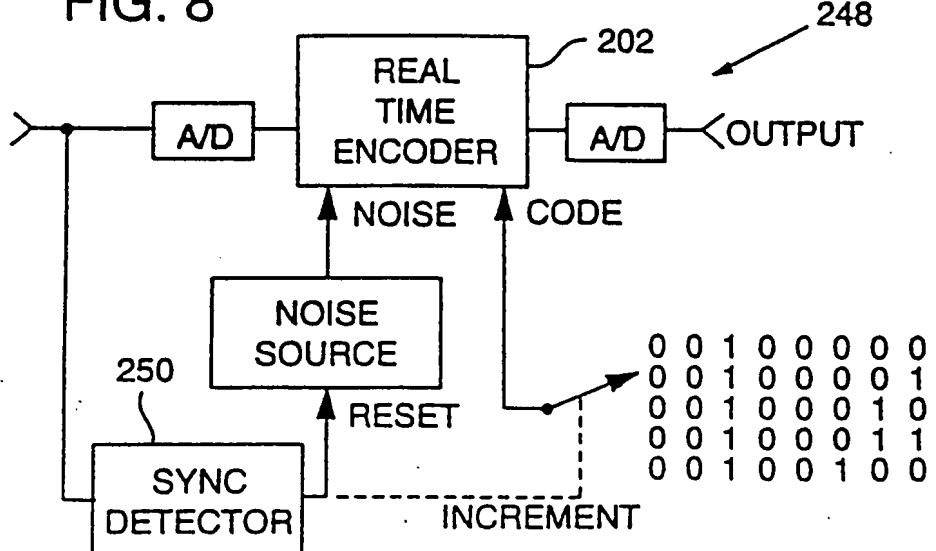


FIG. 9A

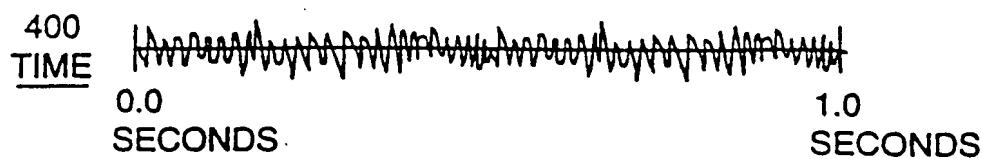


FIG. 9B

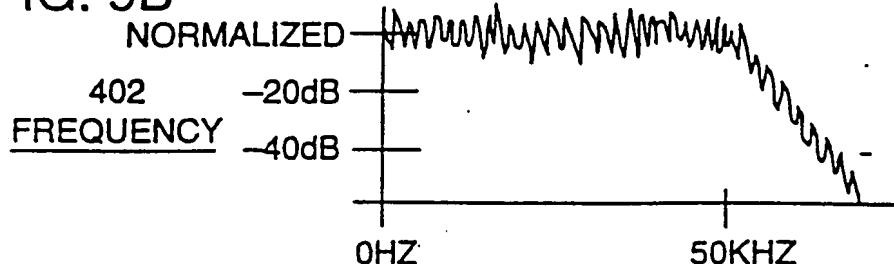


FIG. 9C

BORDER
CONTINUITY
404

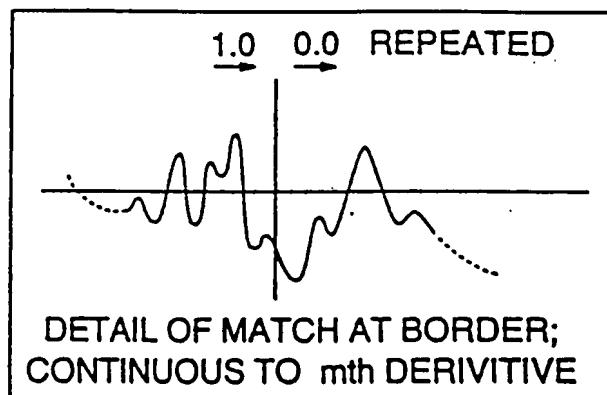
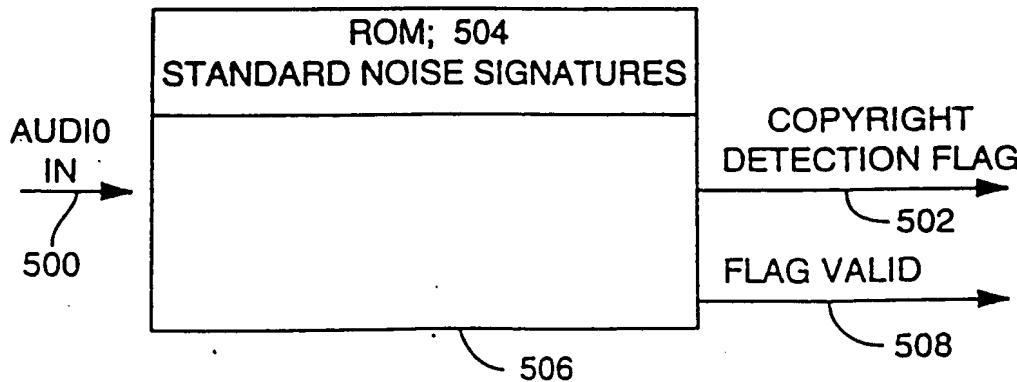


FIG. 10



0002745922-4442025

0000000000000000

FIG. 11

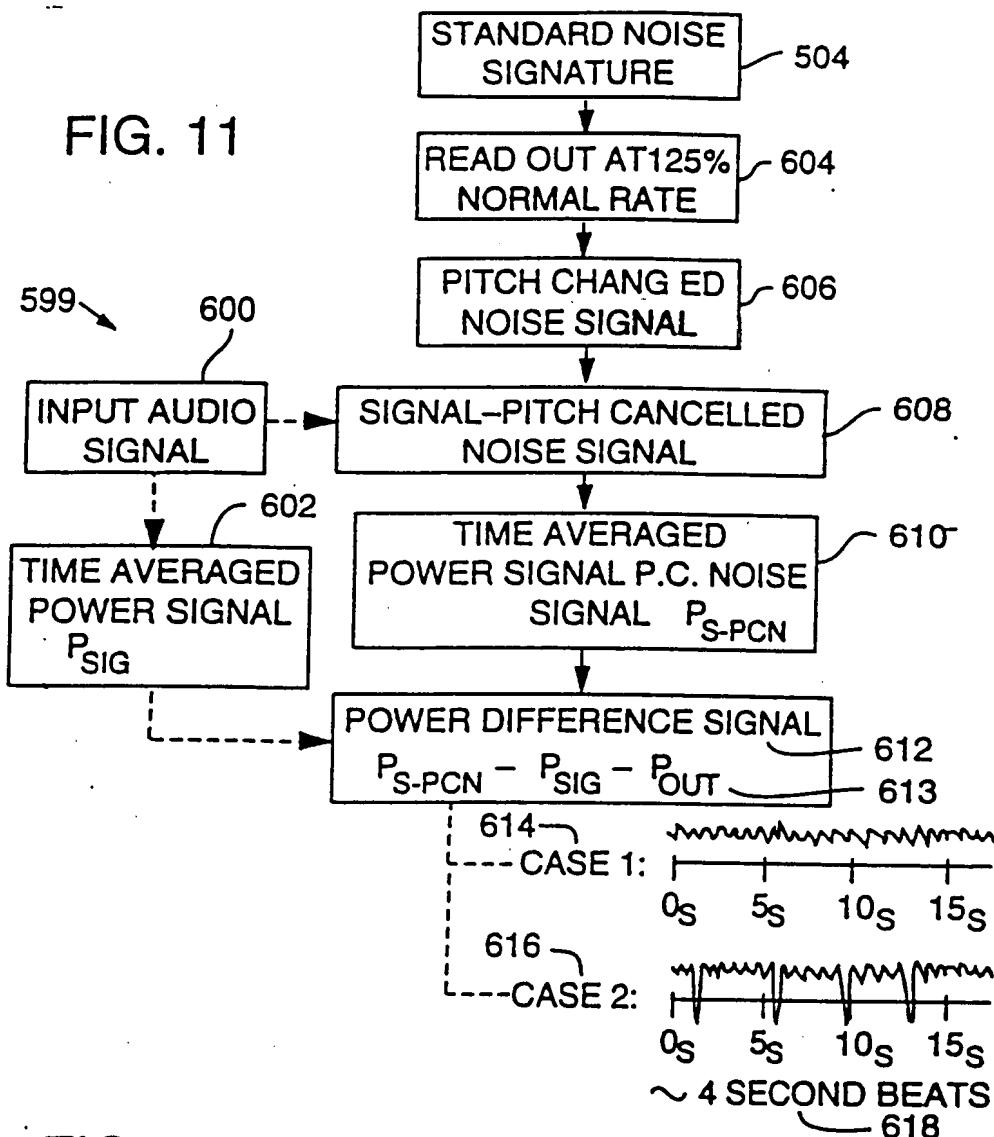


FIG. 12

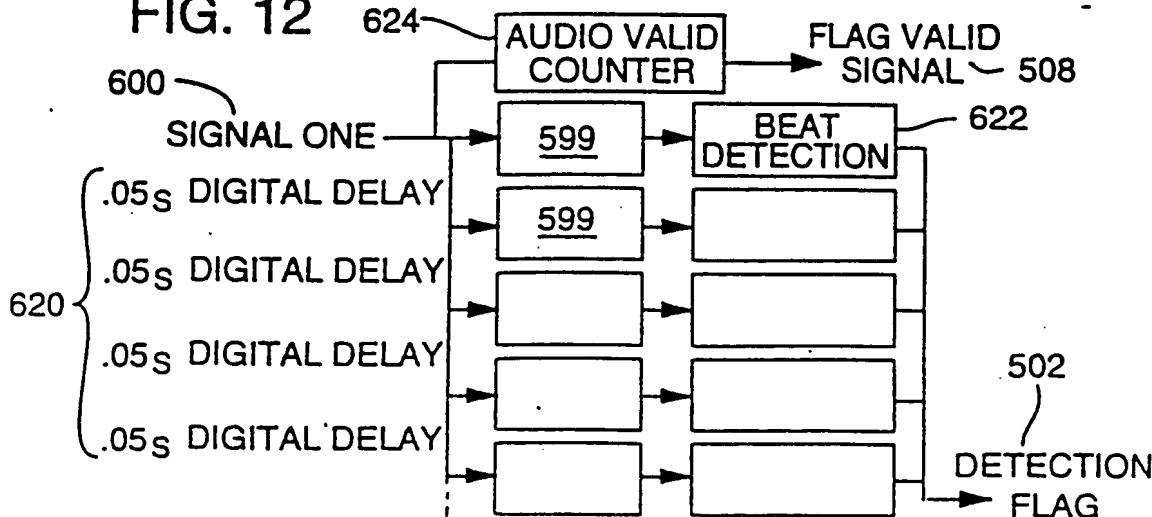
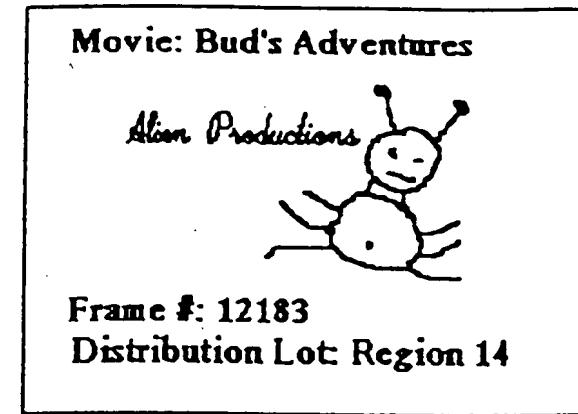
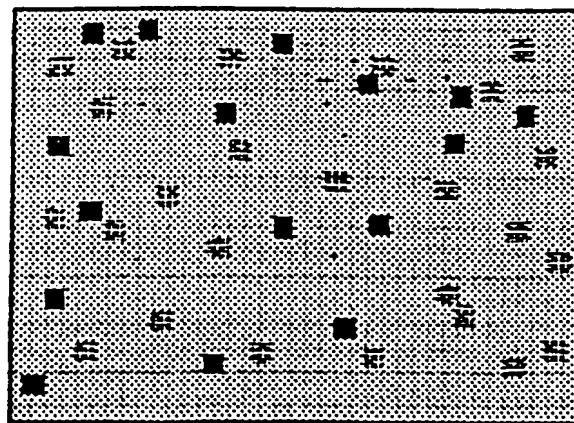


Figure 13

0967465422-1122005

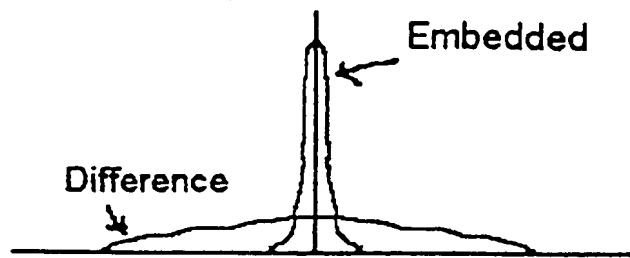


Encryption/Scrambling
Routine # 28 ,702



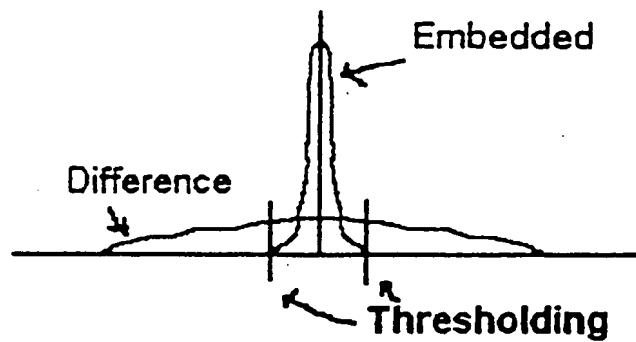
**704 Pseudo-Random Master Snowy Image
(Scaled Down and Added to Frame 12183)**

Figure 14



720, Mean-Removed Histograms of . Difference Signal and Known Embedded Code Signal -

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722, Mean-Removed Histograms of First Derivatives (or scalar gradients In the case of an Image)

Figure 15

08746543442006

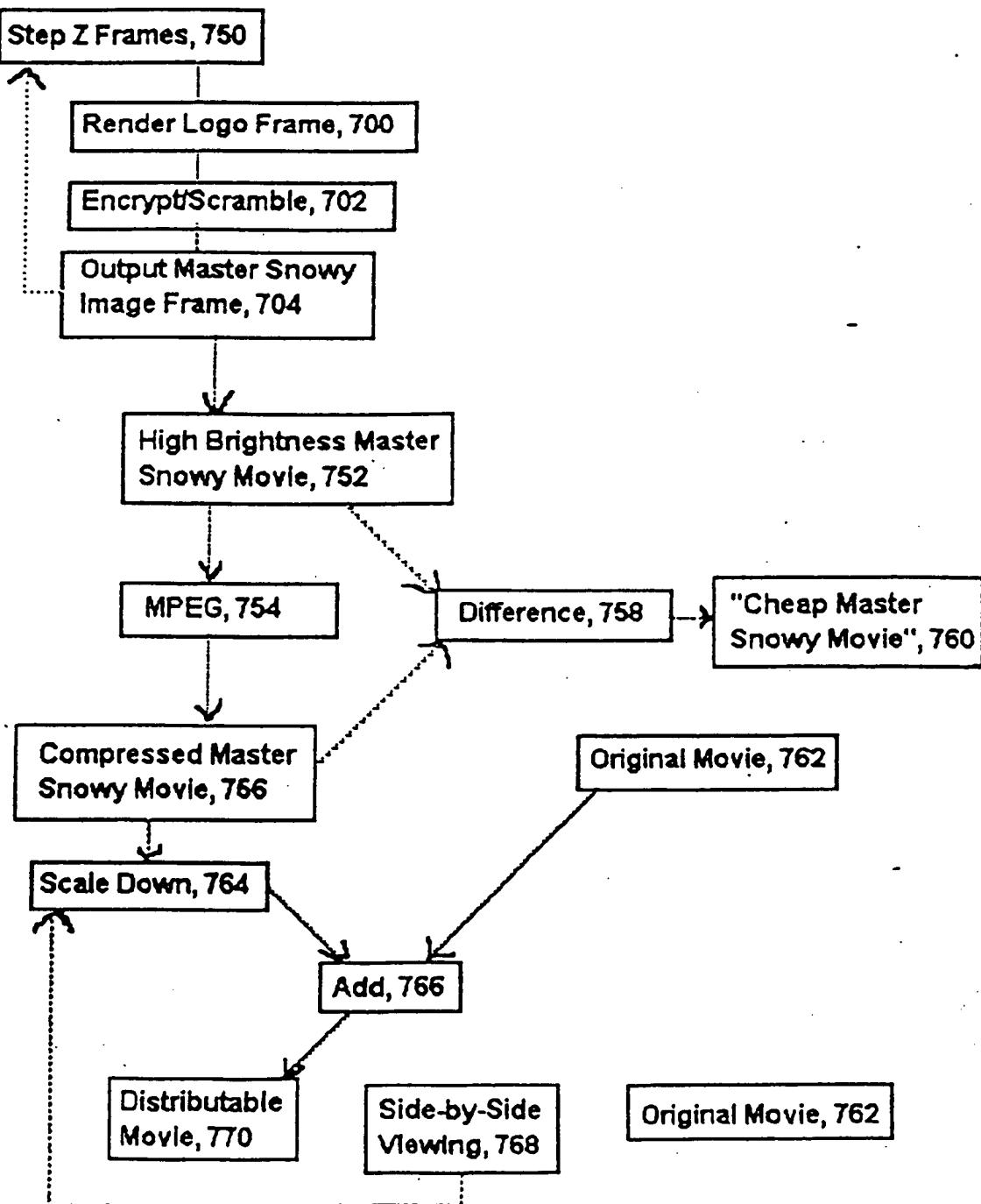
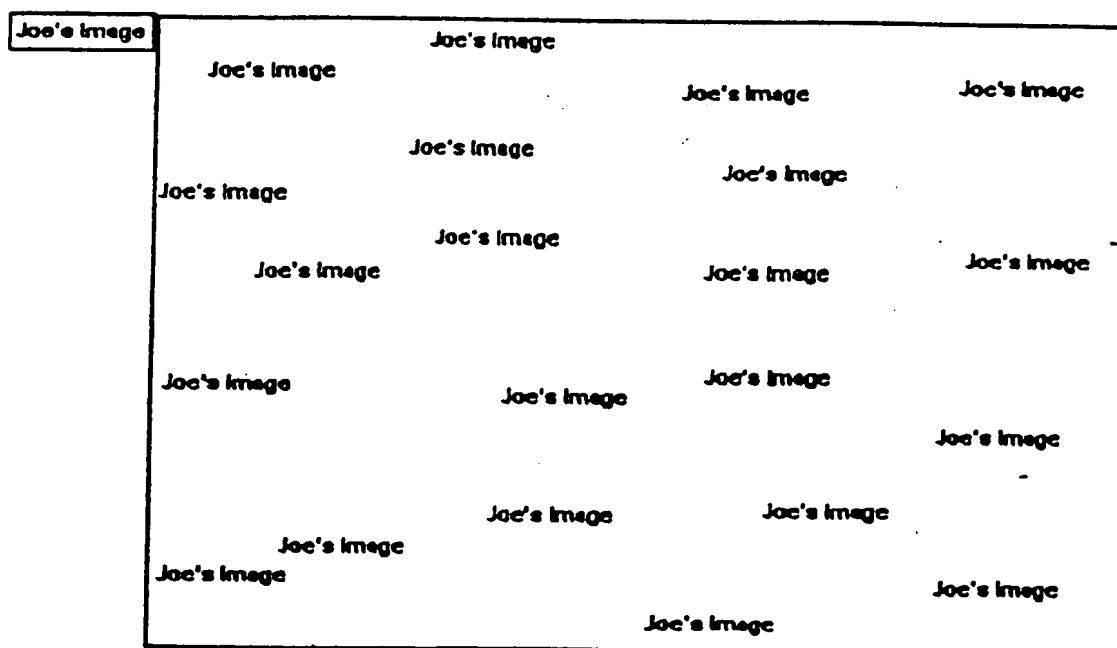
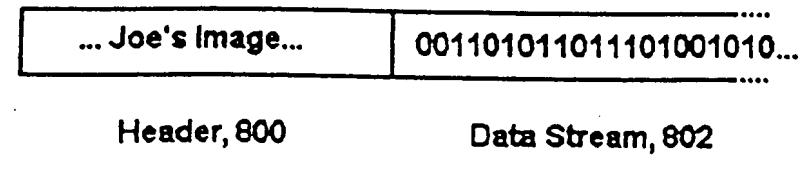
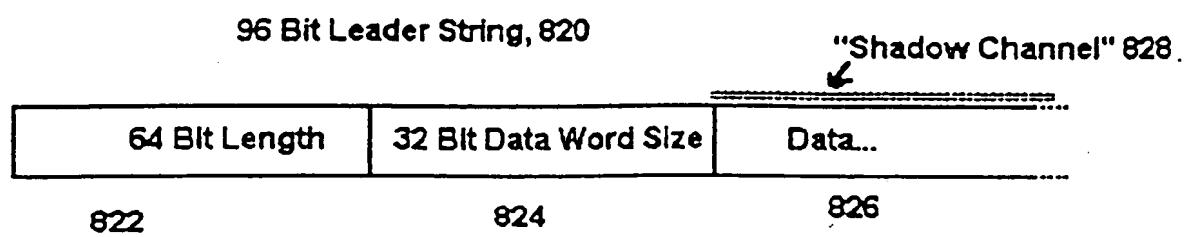


Figure 16



001101011011101001010...

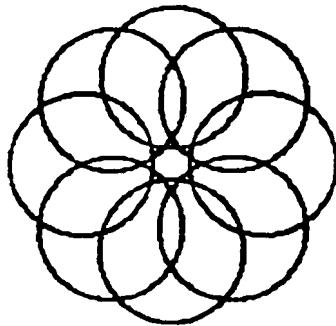
Figure 17



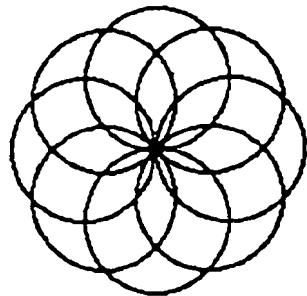
Universal Empirical Data Format

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Figure 18



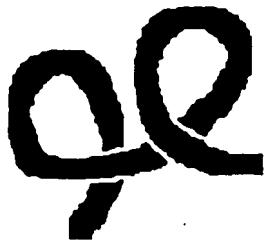
Supra-radial Knots, 850



Radial Knots, 852

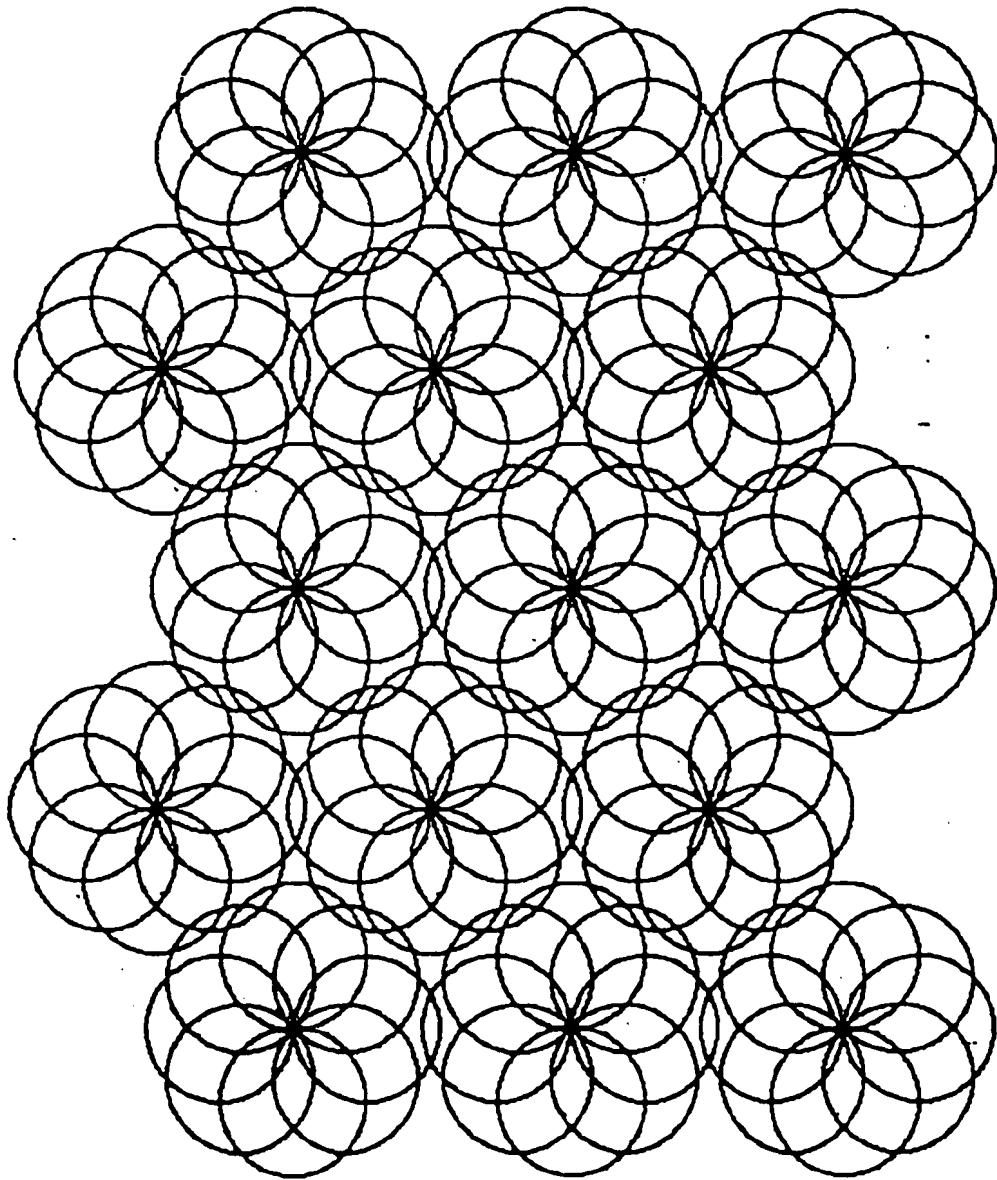


**854, One basic concept of the knot is an overlapping of
one strand of finite width over another strand**



864, Another basic concept is the symmetric weaving of overlaps

Figure 19

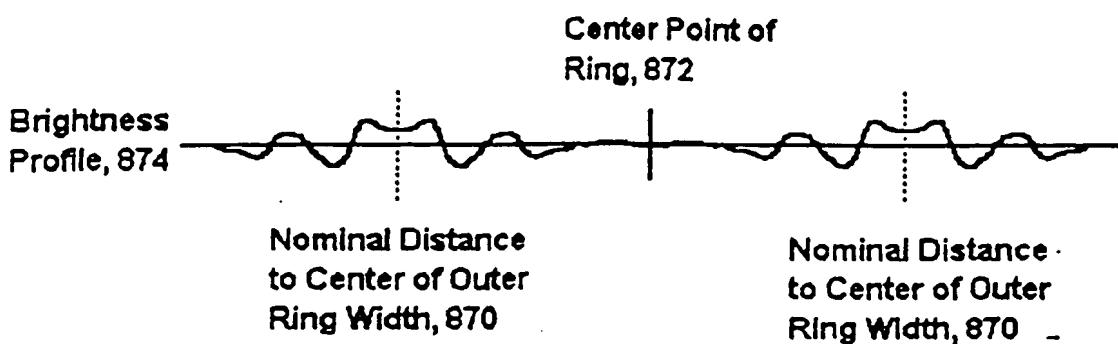


08745622 114295

**866, Quest for Mosaiced Knot Patterns which "Cover" and
are Coextensive with Original Image;**

**All elemental knot patterns can convey the same
information, such as a signature, or each can convey a
new message in a steganographic sense**

Figure 20



876, 2-D brightness of phase-only filtered ring is similar to the above brightness pattern rotated about central point of ring :

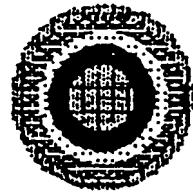
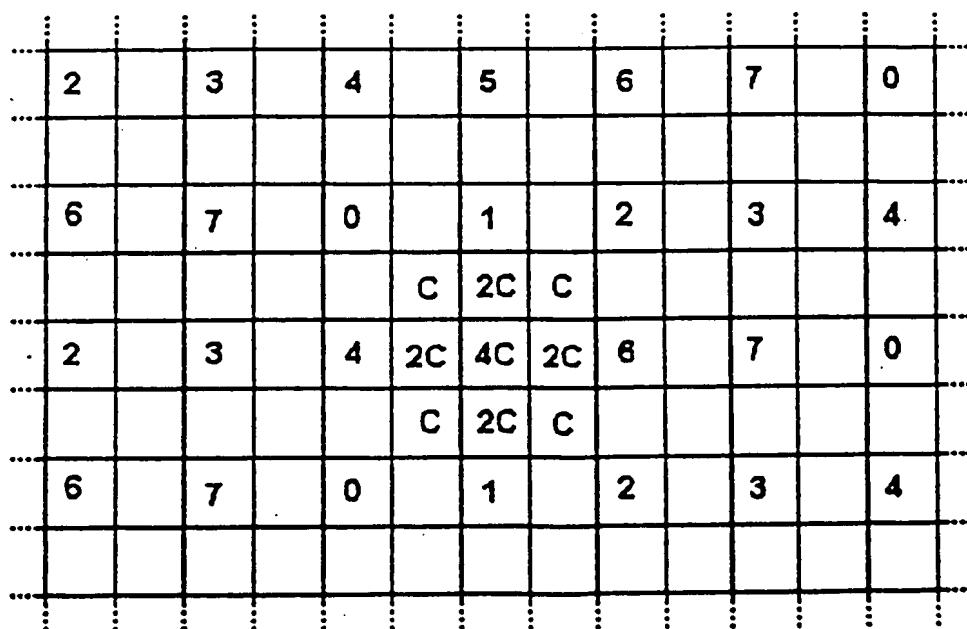


Figure 21A

| | | |
|----|----|----|
| C | 2C | C |
| 2C | 4C | 2C |
| C | 2C | C |

where $C = 1/16$

Elementary Bump, 900
(Defined grouping of pixels with
weight values)



Example of how elementary bumps, 900, would be assigned locations in an image, and those locations would be associated with a corresponding bit plane in the N-bit word, here taken as N=8 with indexes of 0-7. One location, associated with bit plane "5", has the overlay of the bump profile depicted.

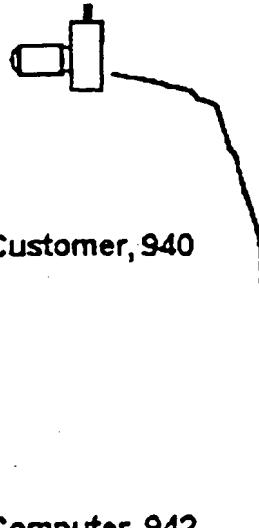
FIG. 21B

Figure 22

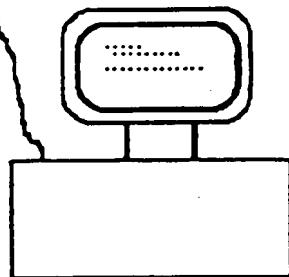
00000000000000000000000000000000



Digital Image Taken of Customer, 940

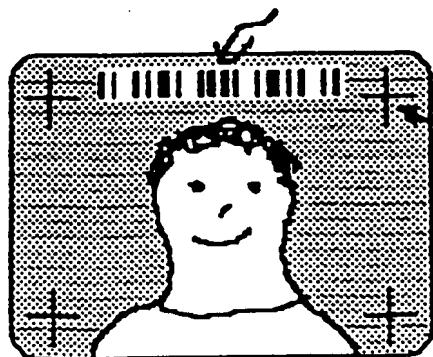


Computer, 942,
Processes New
Encoded Image



Prints Processed
Image onto
Plastic Card

Barcode ID and/or Text, 962

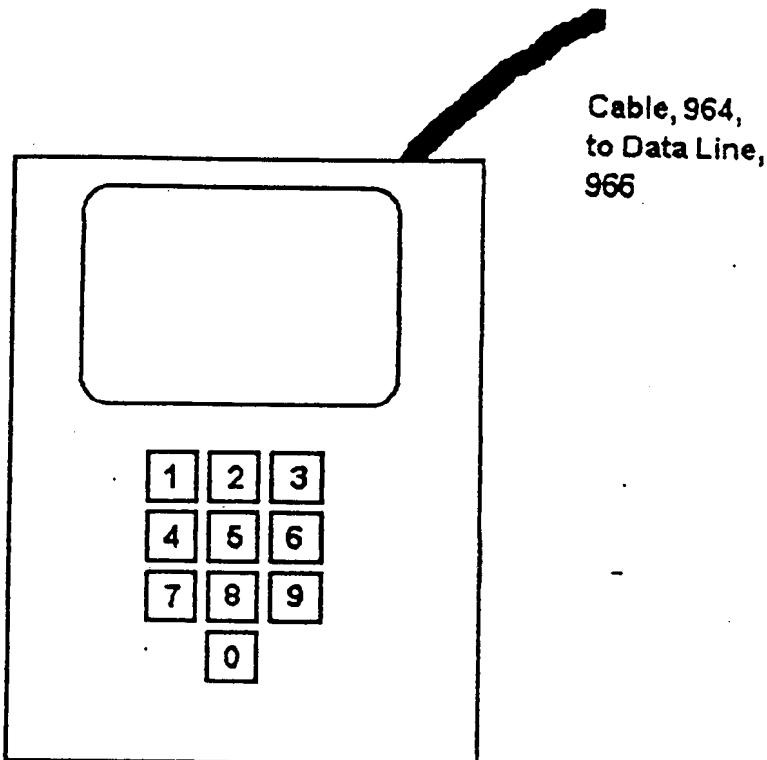


Personal Cash Card, 950

Figure 23

Optical
Window, 960

PIN
Key Punch,
962



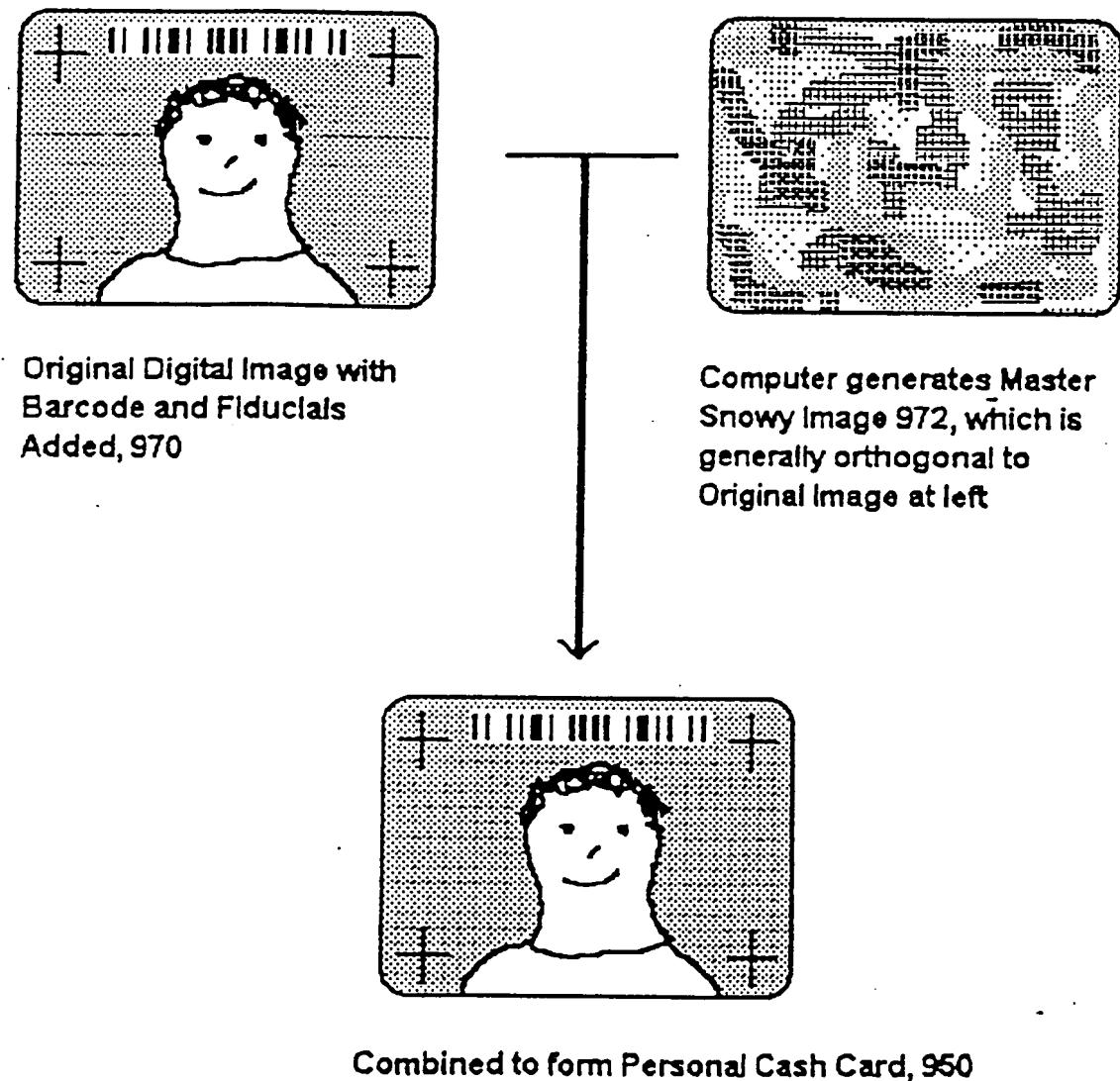
Low Cost Point-of-Sale Optical Reader, 958

**Contains rudimentary optical scanner,
memory buffers, communications devices,
and microprocessor**

Consumer merely places card into window and can, at their pre-arranged option, either type in a Personal Identification Number (PIN, for added security) or not. The transaction is approved or disapproved within seconds.

00000000000000000000000000000000

Figure 24



0921465613 * 112295

Figure 25

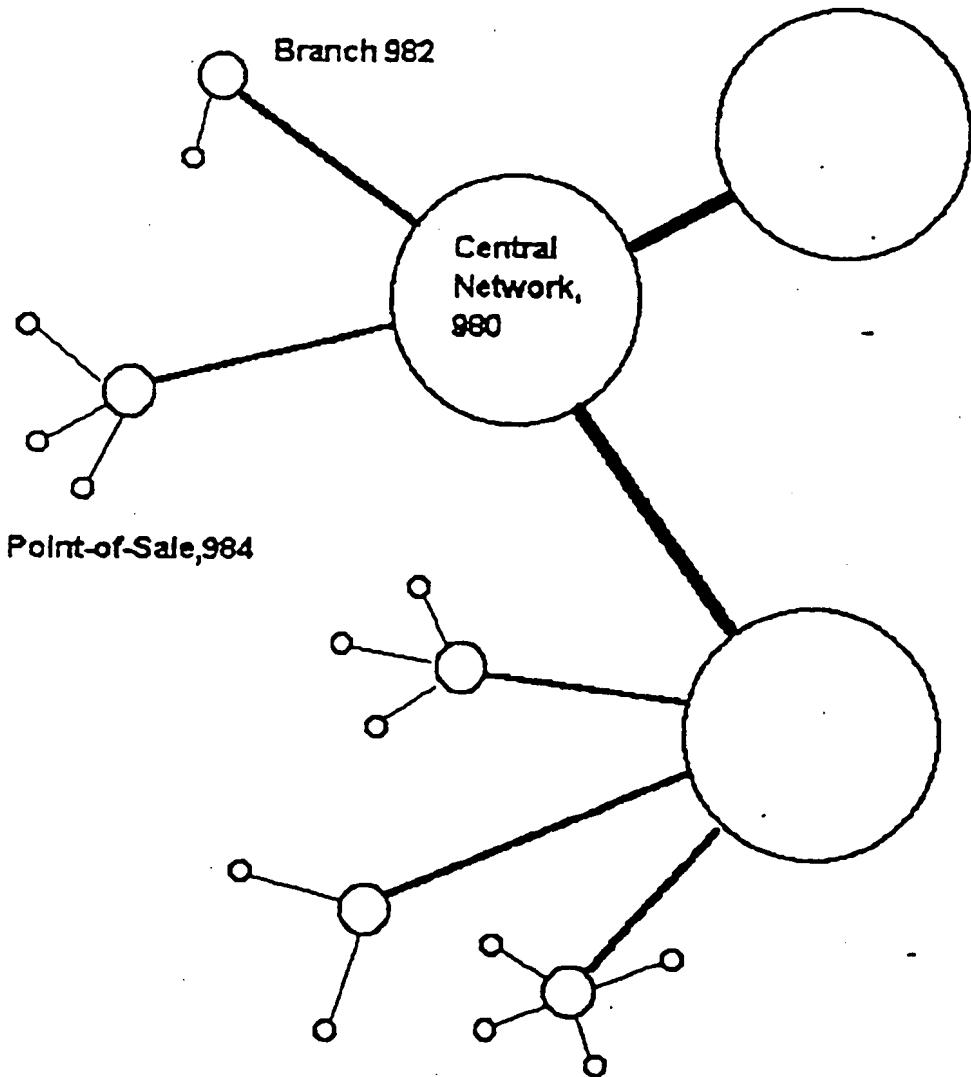
Typical Transaction Steps

1. Reader scans images on card, stores in memory, extracts persons ID
2. Optional: User keys in PIN number
3. Reader calls central account data network, handshakes
4. Reader sends ID, (PIN), merchant information, and requested transaction amount to central network
5. Central Network verifies ID, PIN, Merchant info, and account balance
6. If OK, Central Network generates twenty four sets of sixteen distinct random numbers, where the random numbers are indexes to a set of 64K orthogonal spatial patterns
7. Central Network transmits first OK, and the sets of random numbers
8. Reader steps through the twenty four sets
 - 8A. Reader adds together set of orthogonal patterns
 - 8B. Reader performs dot product of resultant pattern and card scan, stores result
9. Reader transmits the twenty four dot product results to Central Network
10. Central Network checks results against master
11. Central Network sends final approval or denial
12. Central Network debits Merchant Account, credits Card account

00000000000000000000000000000000

Figure 26

The Negligible-Fraud Cash Card System



0002465423 - 442295

A basic foundation of the cash card system is a 24 hour information network, where both the stations which create the physical cash cards, 950, and the point-of-sales, 984, are all hooked up to the same network continuously

0324554133 • 14720

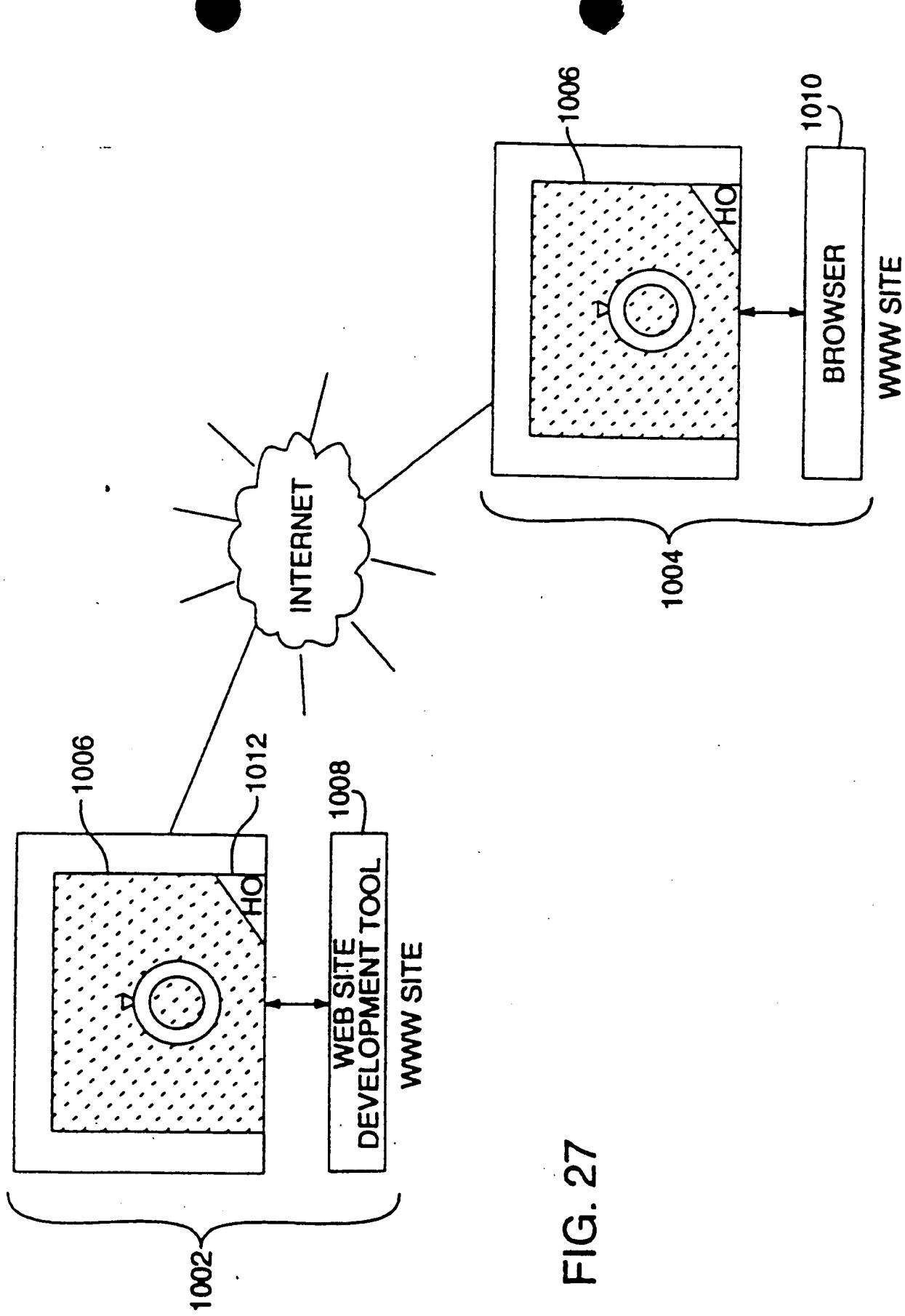
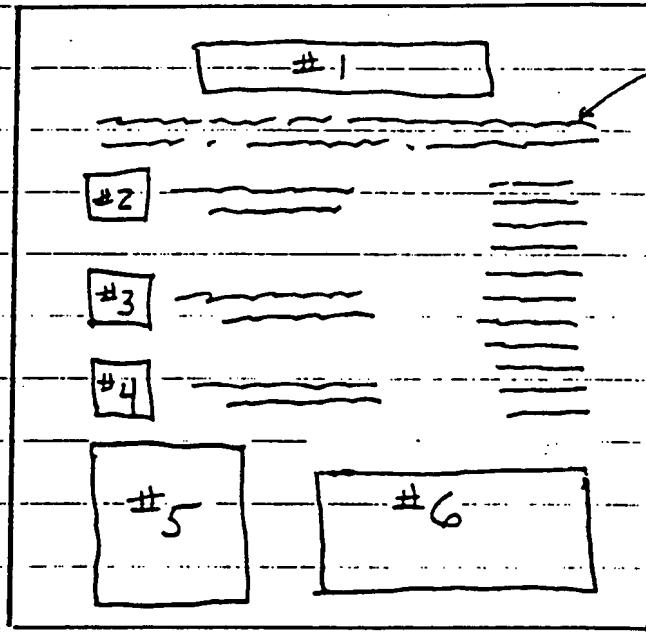


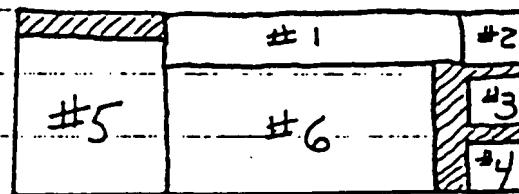
FIG. 27

FIG. 27A



037455313 - 1.1.42205

FIG. 27B



9637455413 44700

Fig. 28.

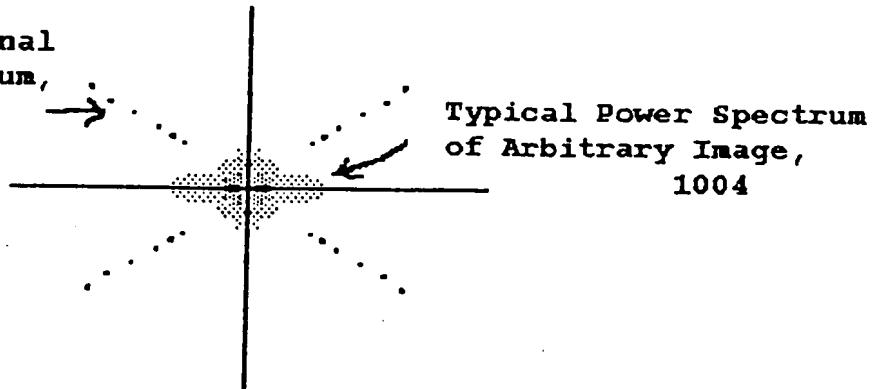


Figure 29

UV Plane, 1000

Embedded Signal
Power Spectrum,
1002

Typical Power Spectrum
of Arbitrary Image,
1004



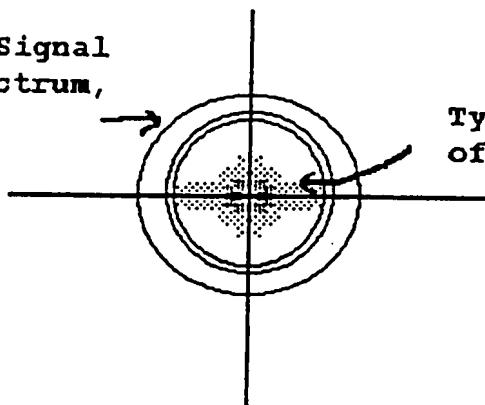
Non-harmonic spatial frequencies along the
45 degree axes, giving rise to a weave-like
cross-hatching pattern in the spatial domain

Figure 30

UV Plane, 1000

Embedded Signal
Power Spectrum,
1006

Typical Power Spectrum
of Arbitrary Image,
1004



Non-harmonic concentric circles in UV plane,
where phase hops quasi-randomly along each
circle, giving rise to pseudo random looking
patterns in the spatial domain

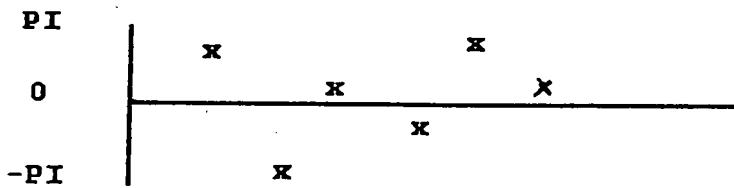
DRAFT COPY - DO NOT CITE

F G 29 A

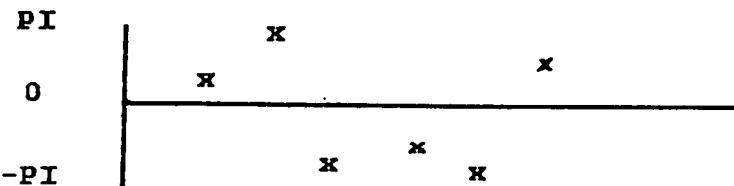
One Quadrant
Spatial Transform Domain

0845513 11.4.2005

Figure 31A.



Phase of spatial frequencies along forward 45 degree axes, 1008



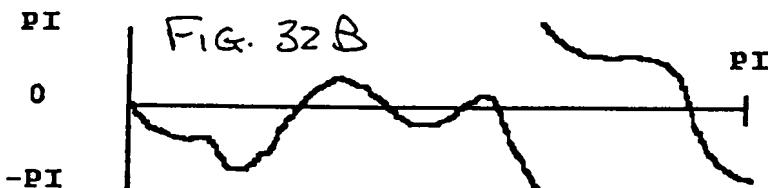
Phase of spatial frequencies along backward 45 degree axes, 1010

FIG. 31B

Figure '32A



**Phase of spatial
frequencies along
first concentric ring,
1012**

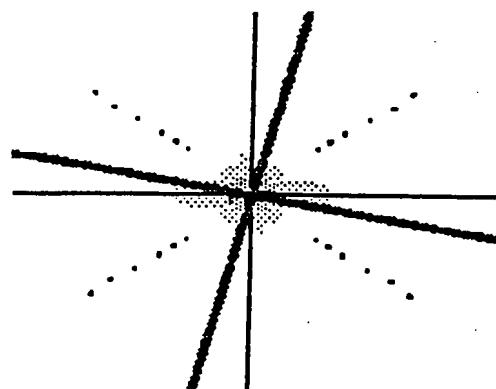


Phase of spatial
frequencies along
second concentric ring
1014



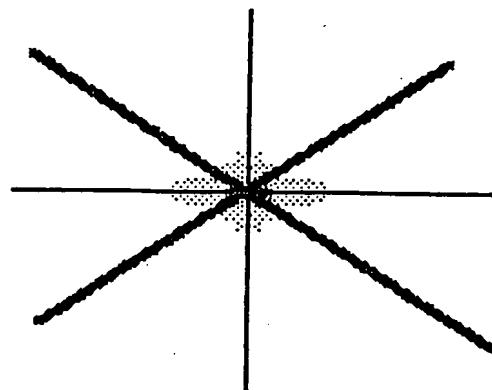
Phase of spatial
frequencies along
third concentric ring,
1016

Figure 33A



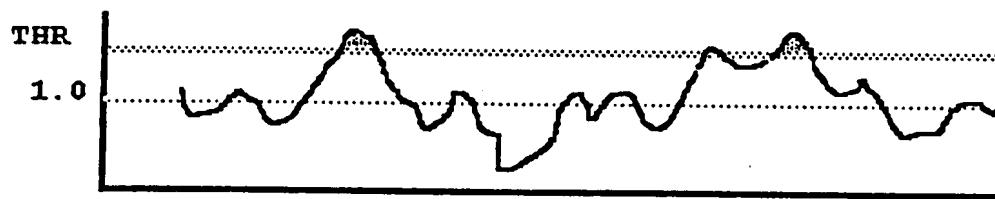
Angle A 1018

FIG. 33B



Angle B 1020

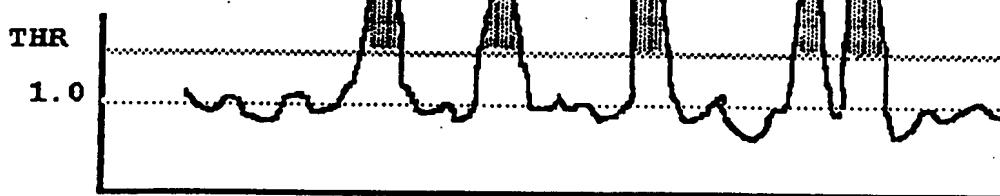
FIG. 33C



Power profile along Angle A, as normalized by its own moving average; only a minimal amount exceeds threshold, giving a small integrated value

1022

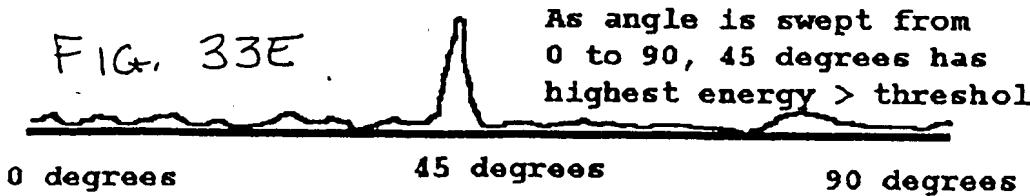
FIG. 33D



Power profile along Angle B, as normalized by its own moving average; this finds strong energy above the threshold

1024

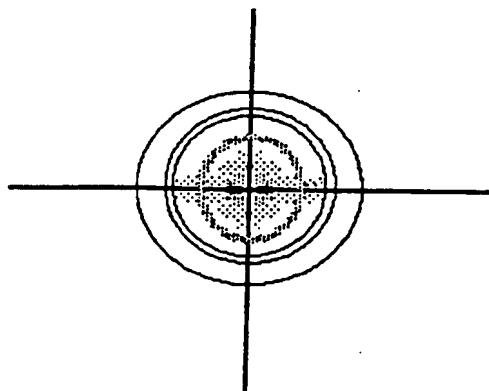
FIG. 33E



As angle is swept from 0 to 90, 45 degrees has highest energy > threshold

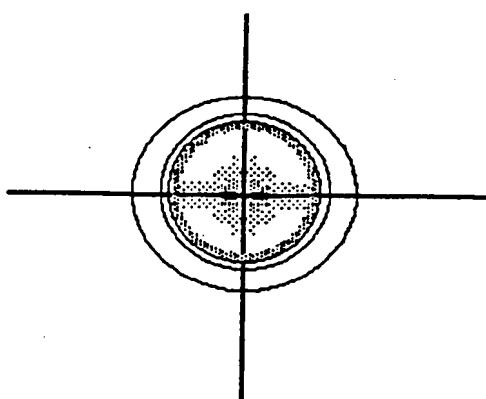
1026

Figure 34A



Radius A, 1028

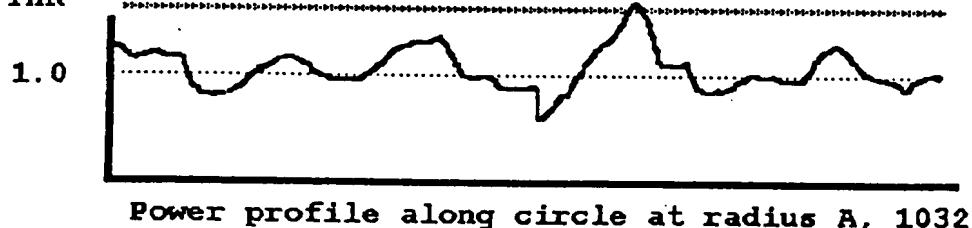
FIG. 34B



Radius B, 1030

01073425-342006

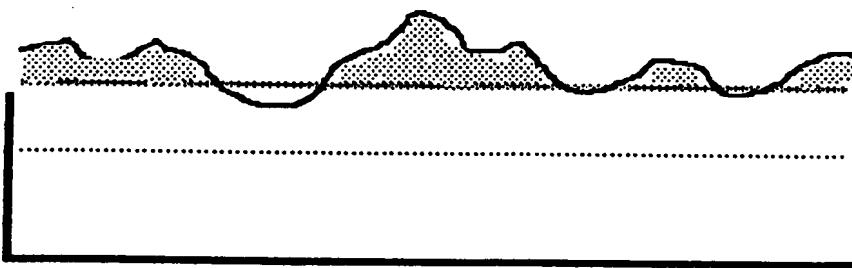
FIG. 34C



Power profile along circle at radius A, 1032

THR

1.0



Power profile along circle at radius B, 1034

FIG. 34D

1036

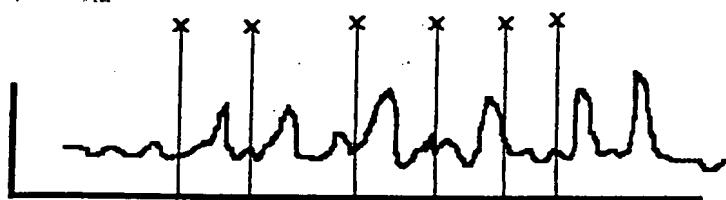
FIG. 34E

Integrated
Power > thresh



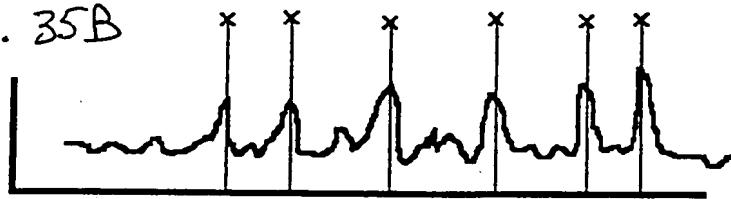
Total integrated power above threshold,
as function of radius 1038

Figure 35A



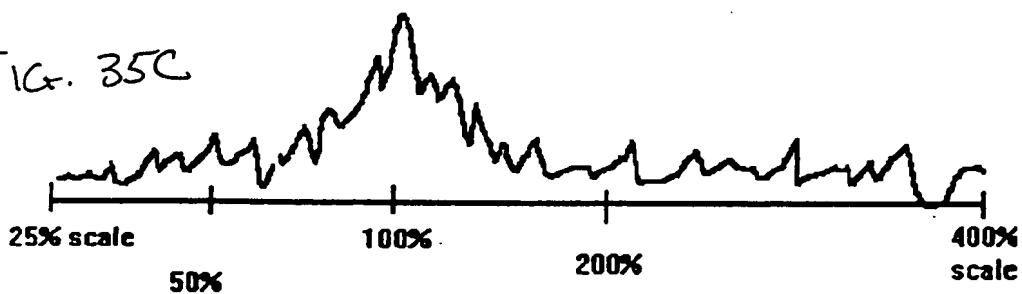
Scale = A; add all power values at the "known" frequencies, 1042

FIG. 35B



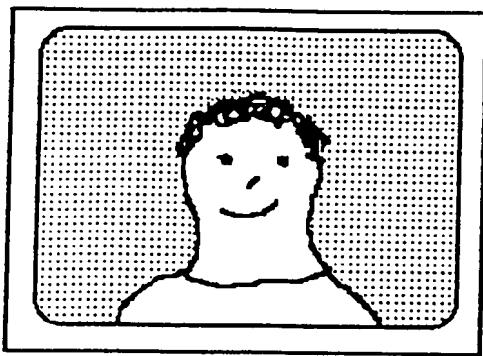
Scale = B; add all power values at the "known frequencies, 1044

FIG. 35C



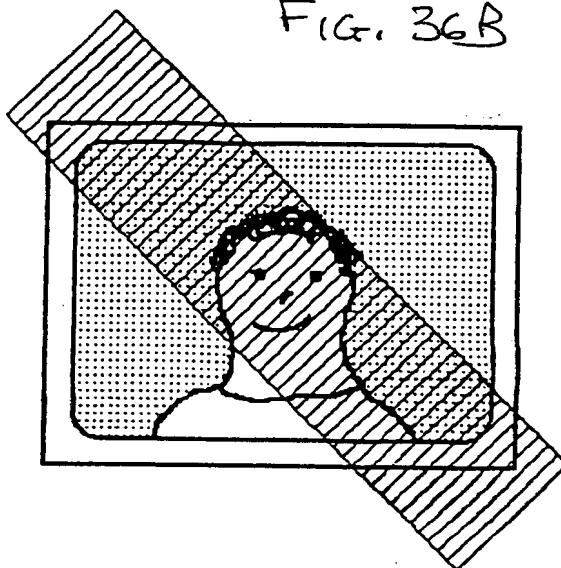
"Scaled-kernel" based matched filter; peak is where the scale of the subliminal grid was found, 1046

Figure 36A



Arbitrary Original Image, 1050,
in which subliminal
graticules may have been placed

FIG. 36B



"Column scan", 1052
is applied along a
given angle through
the center of the
image

Column-
integrated
grey
values,
1054



Start of
scan, 1056

FIG. 36C

End of
scan, 1058

FIG. 36D



Magnitude of Fourier Transform of scan data,
1060

Figure 37

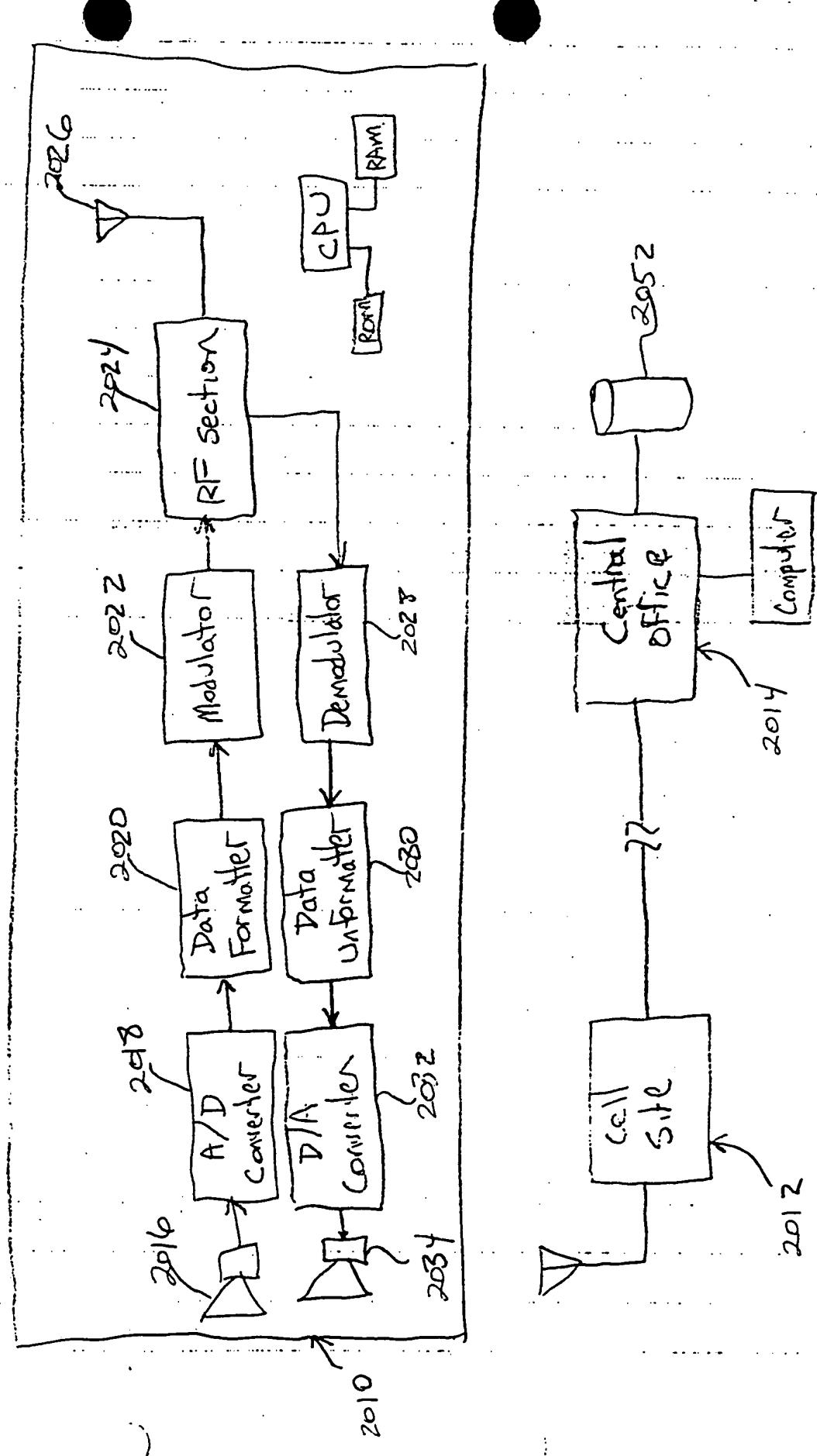
Process steps

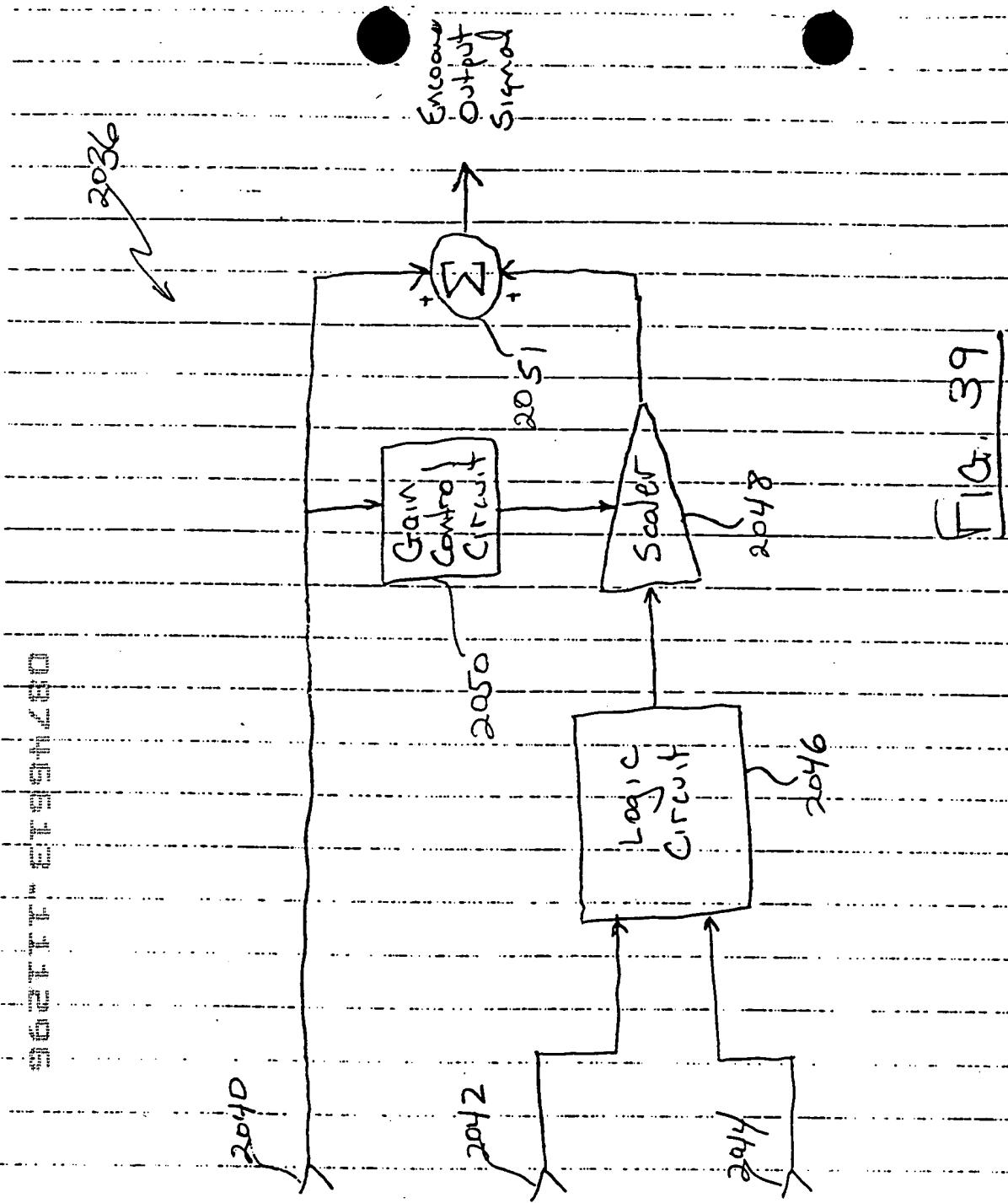
1. Scan in photograph
2. 2D FFT
3. Generate 2D Power spectrum, filter with e.g.
3x3 blurring kernel
4. Step angles from 0 degrees through 90 (1/2 deg)
5. generate normalized vector, with power value
as numerator, and moving averaged power
value as denominator
6. integrate values above some threshold, giving
a single integrated value for this angle
7. end step on angles
8. Find top one or two or three "peaks" from the
angles in loop 4 , then for each peak...
9. Step scale from 25% to 400% ,step ~1.01
10. Add the normalized power values corresponding
to the 'N' scaled frequencies of standard
11. Keep track of highest value in loop
12. end loop 9 and 8, determine highest value
13. Rotation and scale now found
14. Perform traditional matched filter to
find exact spatial offset
15. perform any "fine tuning" to precisely
determine rotation, scale, offset

DATA SHEET NUMBER 20

2010 2012 2014 2016 2018 2020 2022 2024 2026

Fig. 38





Digital Data
Logic
Data
Random Pseudo-Data
Symbol Shaper
Encoder
Output
Sync

GSM Transmitter

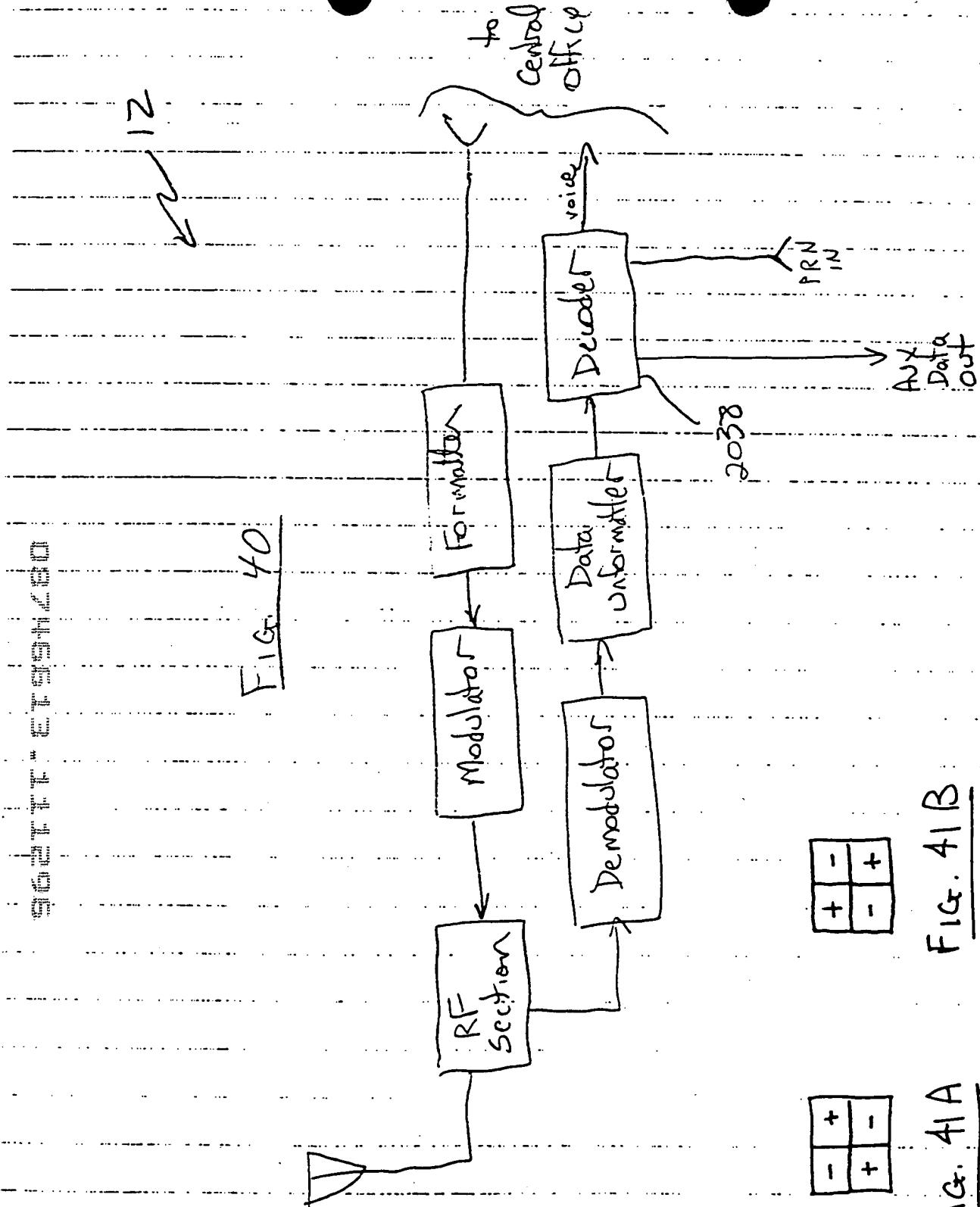
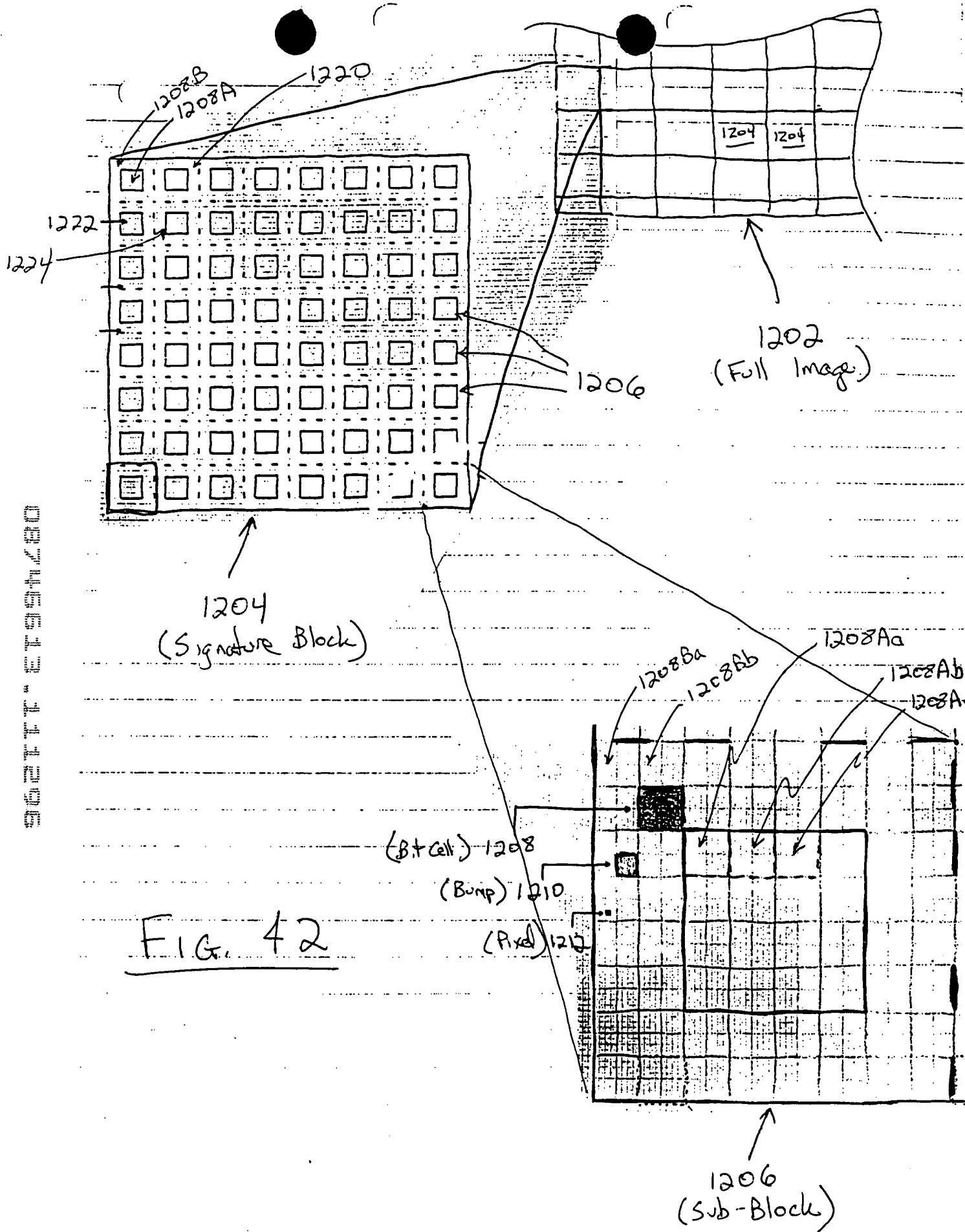


Fig. 41 A

| | |
|---|---|
| + | - |
| - | + |

Fig. 41 B

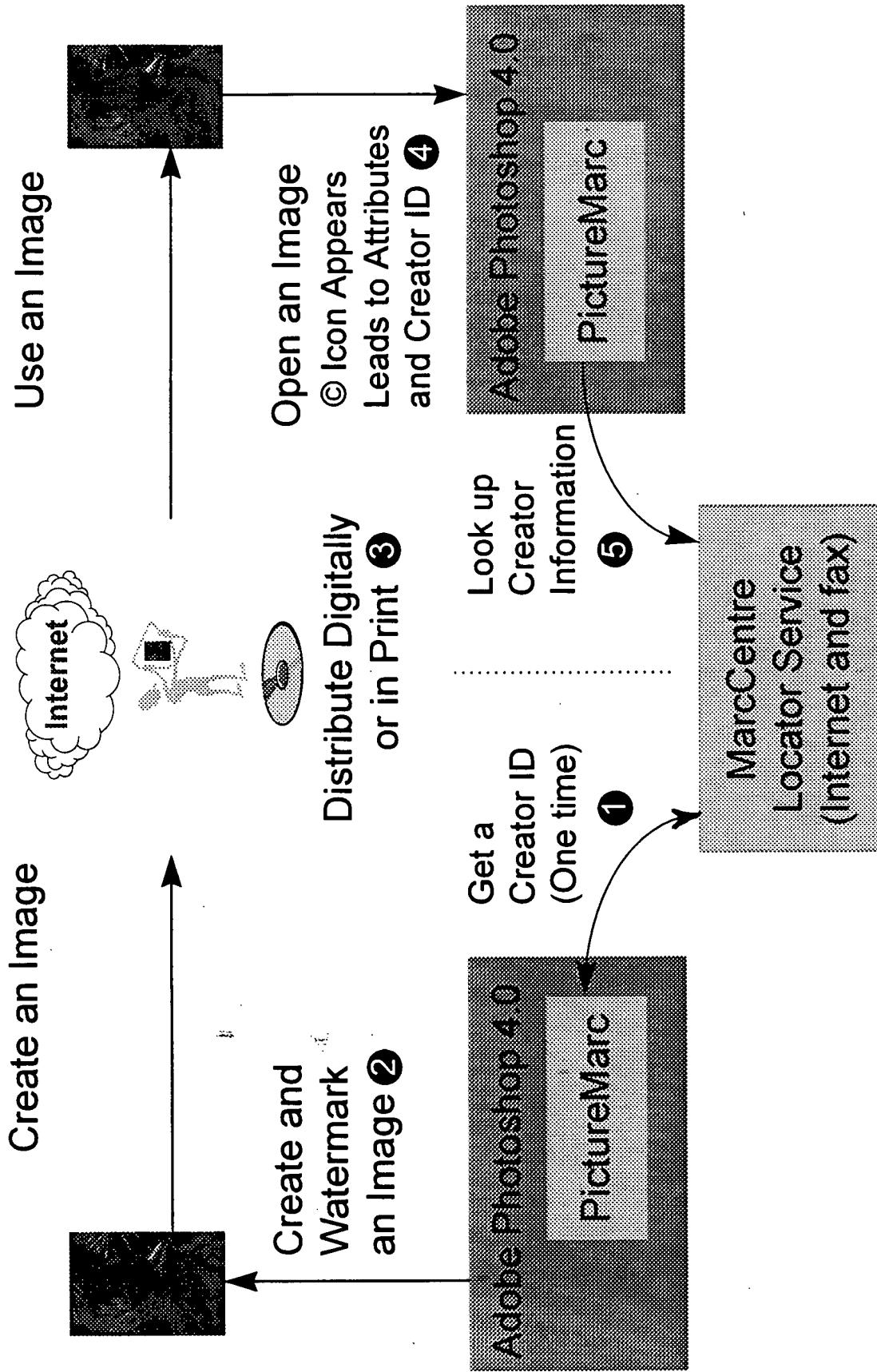
| | |
|---|---|
| + | - |
| - | + |

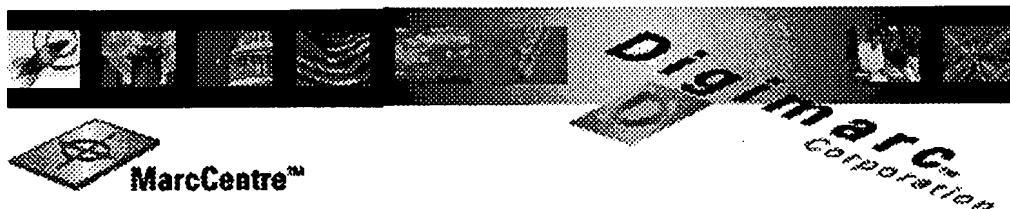


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FIG. 43.

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| Creator Search | Photoshop® 4.0 Offer | Special Offers | Digimarc |
|-----------------|----------------------|----------------|----------|
| Member Services | Subscribe | Feedback | Home |

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FIG. 44



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Address

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State/Province

Zip/Postal Code

Country

Phone Number

Fax Number

Email Address

Your Home Page

 http://

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Phone Number

Show

Don't show

Mailing Address

Show

Don't show

Email Account

Show

Don't show

Yes, I want to be on your mailing lists

Please select your profession (one only).

Photographer

Illustrator

Other

In order to communicate your primary area of focus or specialty to potential customers, please select one of the options from the list below -or- type in your own in the space next to "Custom Specialty"

Photographer

(none)

Illustrator

(none)

Custom Specialty

FIG. 45

Digimarc displays an Image of the Day showcase on our web site. Would you like to participate?

- Yes.
 Not at this time.

For security purposes, you will need to setup a password that allows you to edit your profile information. This password along with your Creator ID are required before you can update your contact information.

Password Re-enter to verify

| | |
|--|--|
| | |
|--|--|

The standard fee for the MarcCentre service is \$150 (US). From now until December 31st, 1996 you can subscribe for only \$79 (US), over 50% off the regular price!

For security reasons, the following credit card information is captured using secured sockets technology.

Credit Card

- Visa
 MasterCard
 American Express

| Card Number | Name Shown on Card | Expiration (MM/YY) |
|-------------|--------------------|--------------------|
| 4 | | |

When you are satisfied with your entries on this form press the "Part 1 Complete" button and continue with the second part of the subscription sign-up. If you wish to cancel, press the Back button on your browser.

Part 1 Complete

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11/5/96

FIG. 46

F16 47

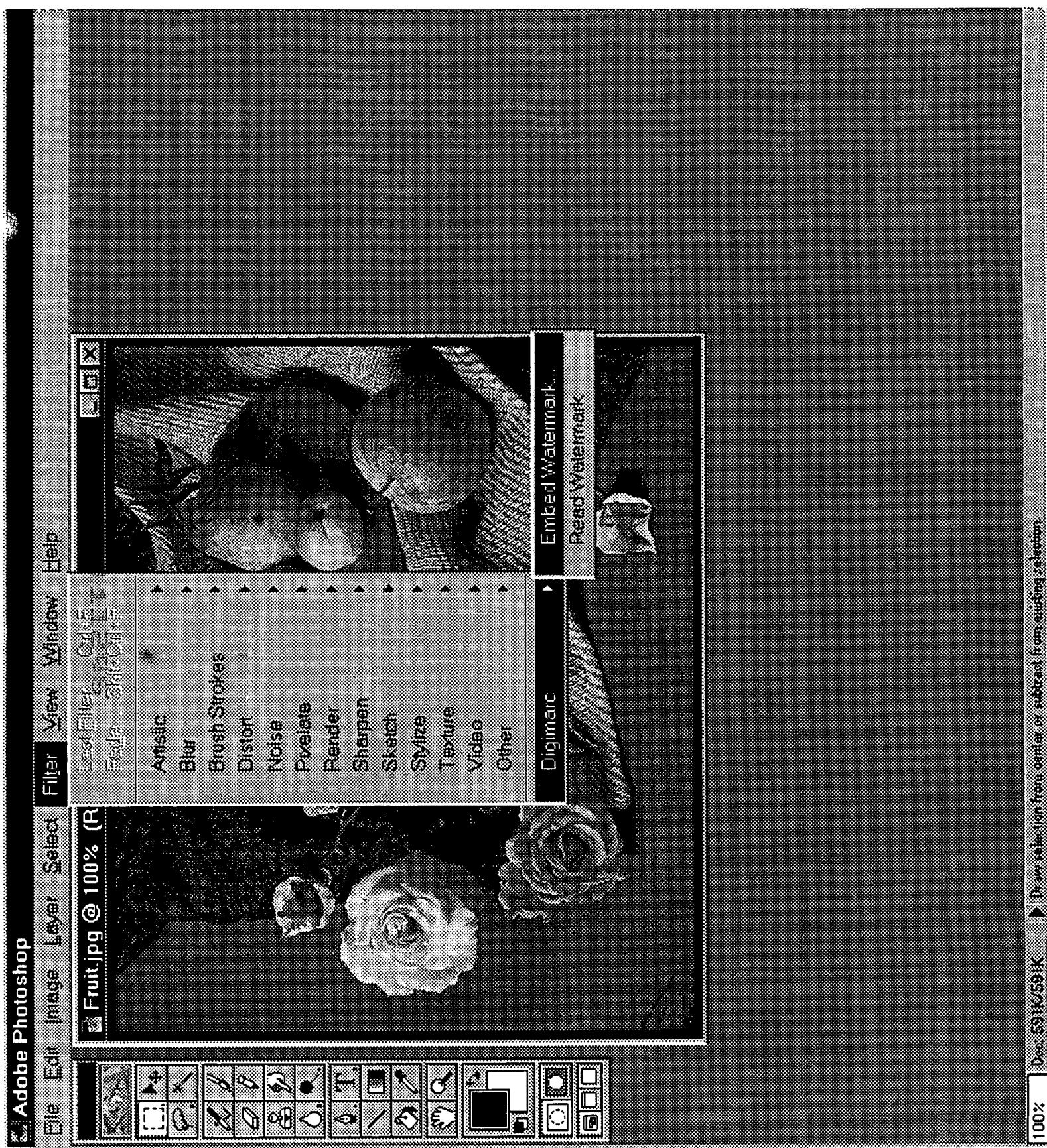


Fig. 48

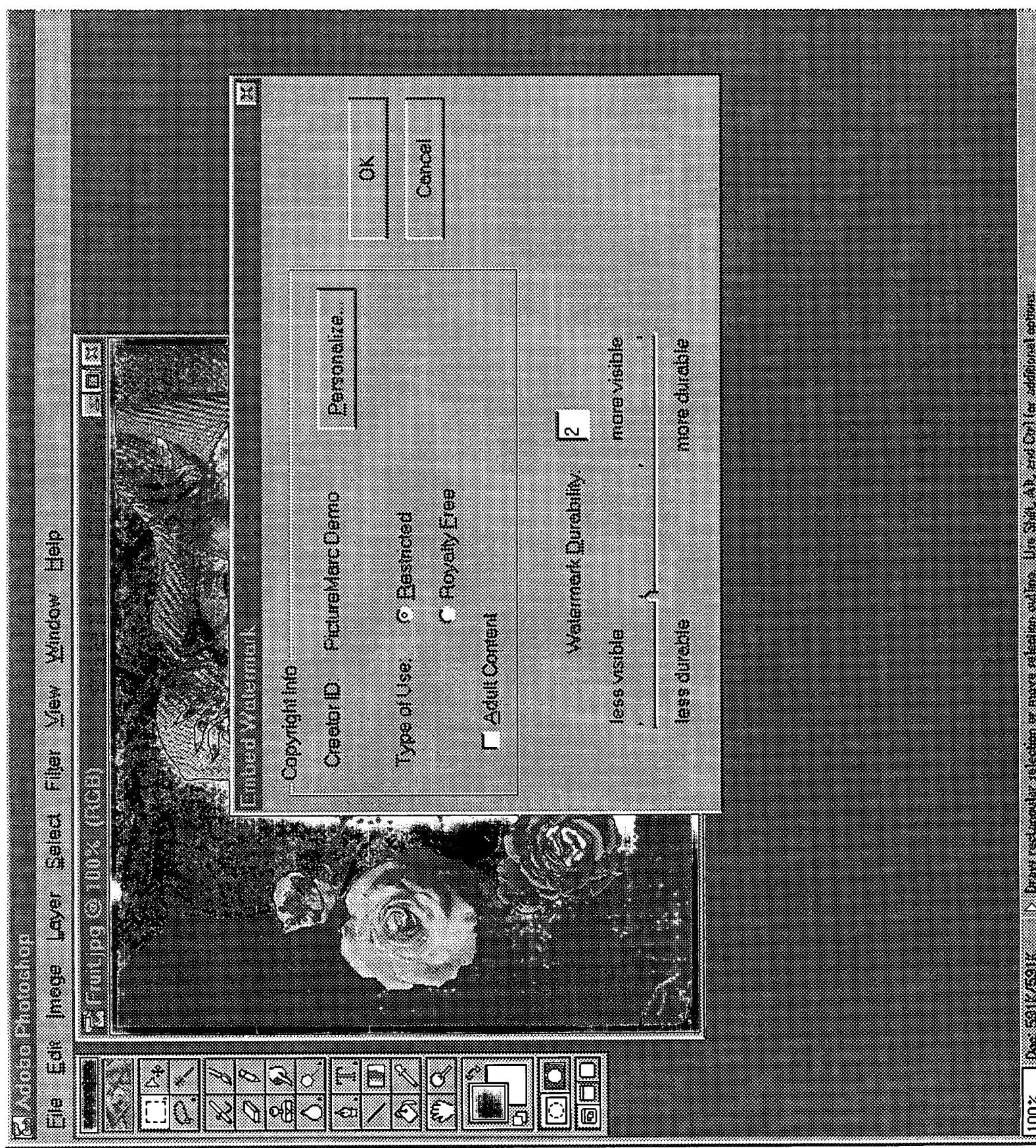
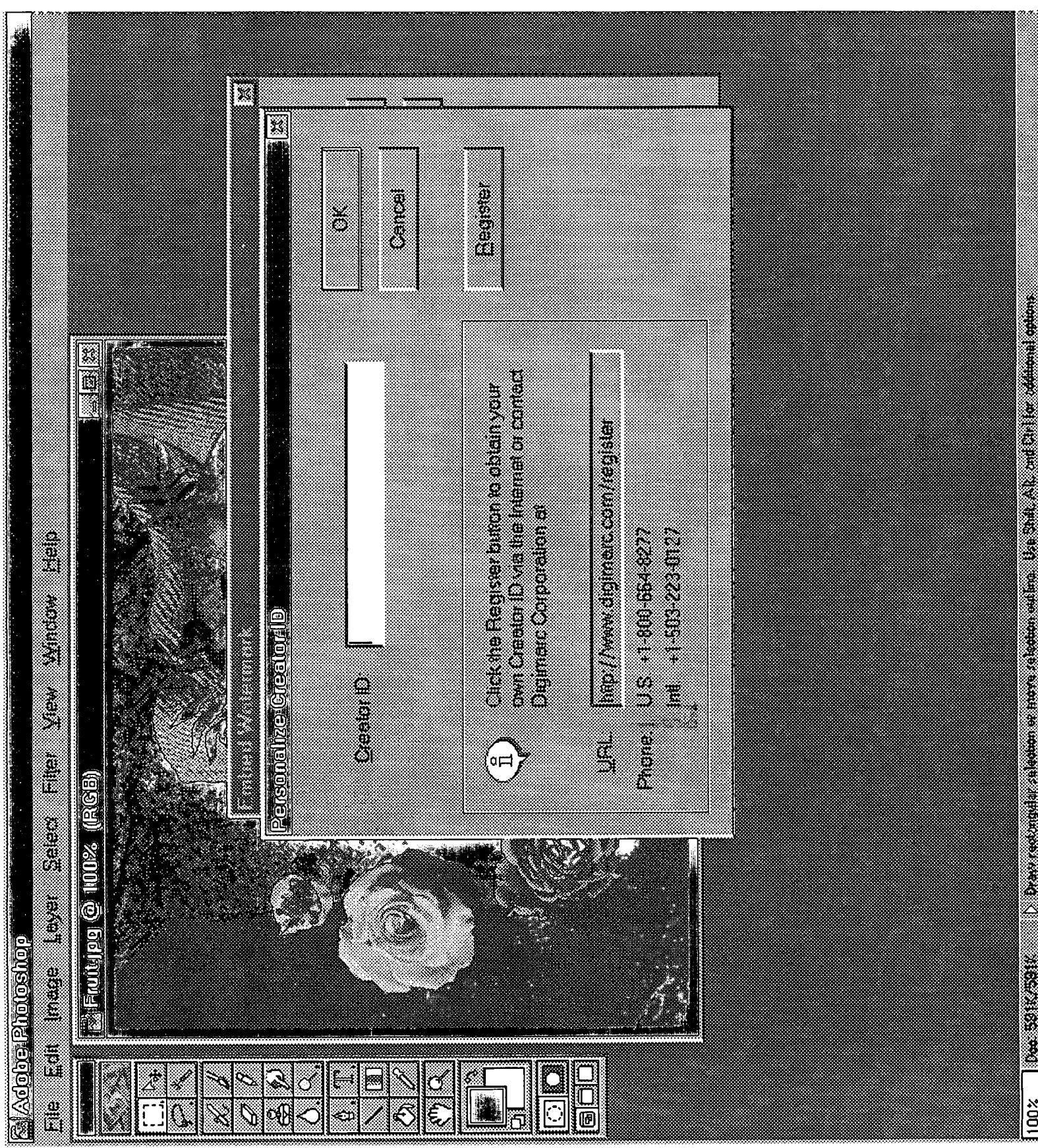
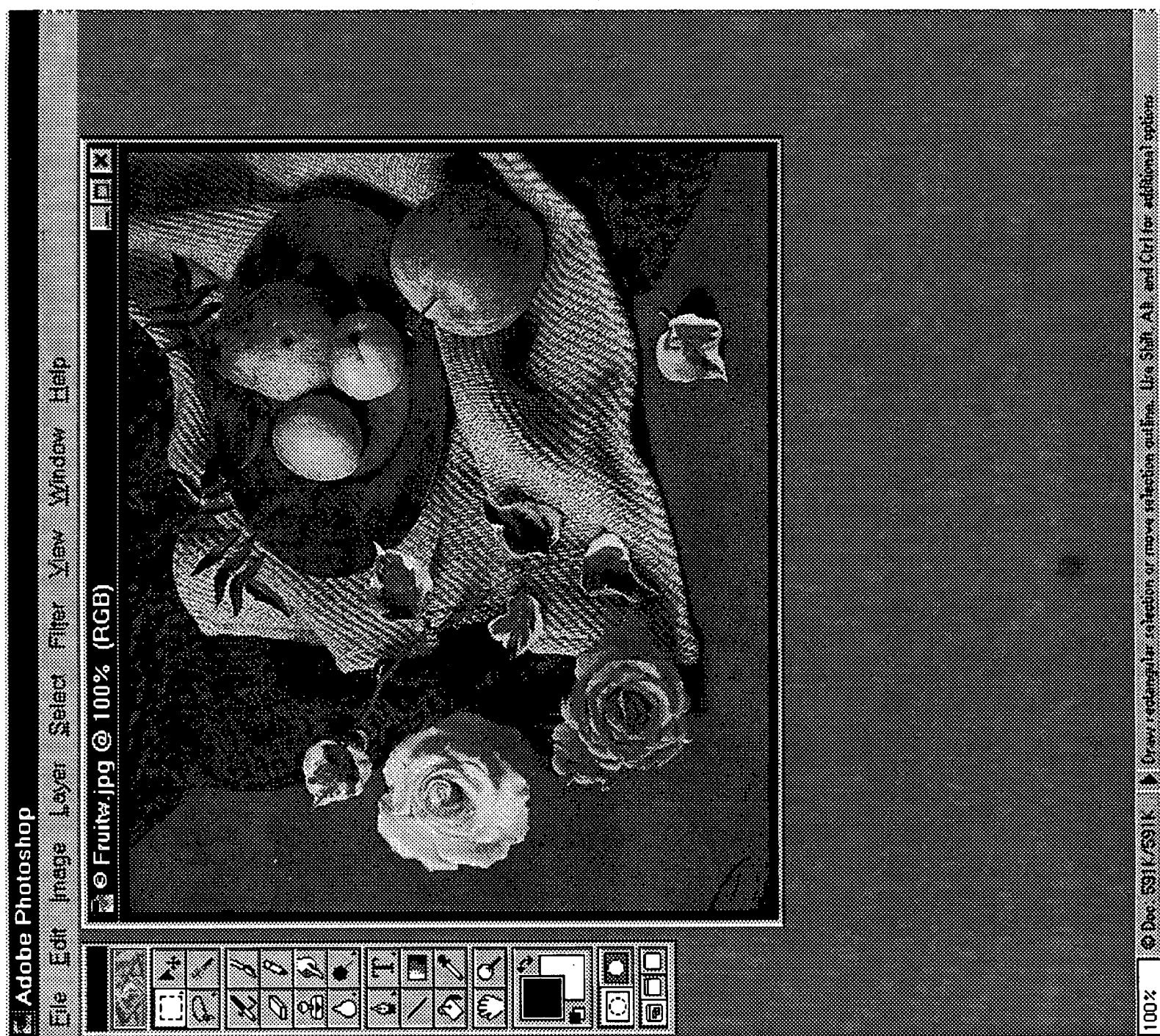


Fig. 49



F16.50



Adobe Photoshop

File Edit Image Layer Select Filter View Window Help

Embed Watermark

Read Watermark

Digital

Other

Artistic

Blur

Brush Strokes

Distort

Noise

Polette

Render

Sharpen

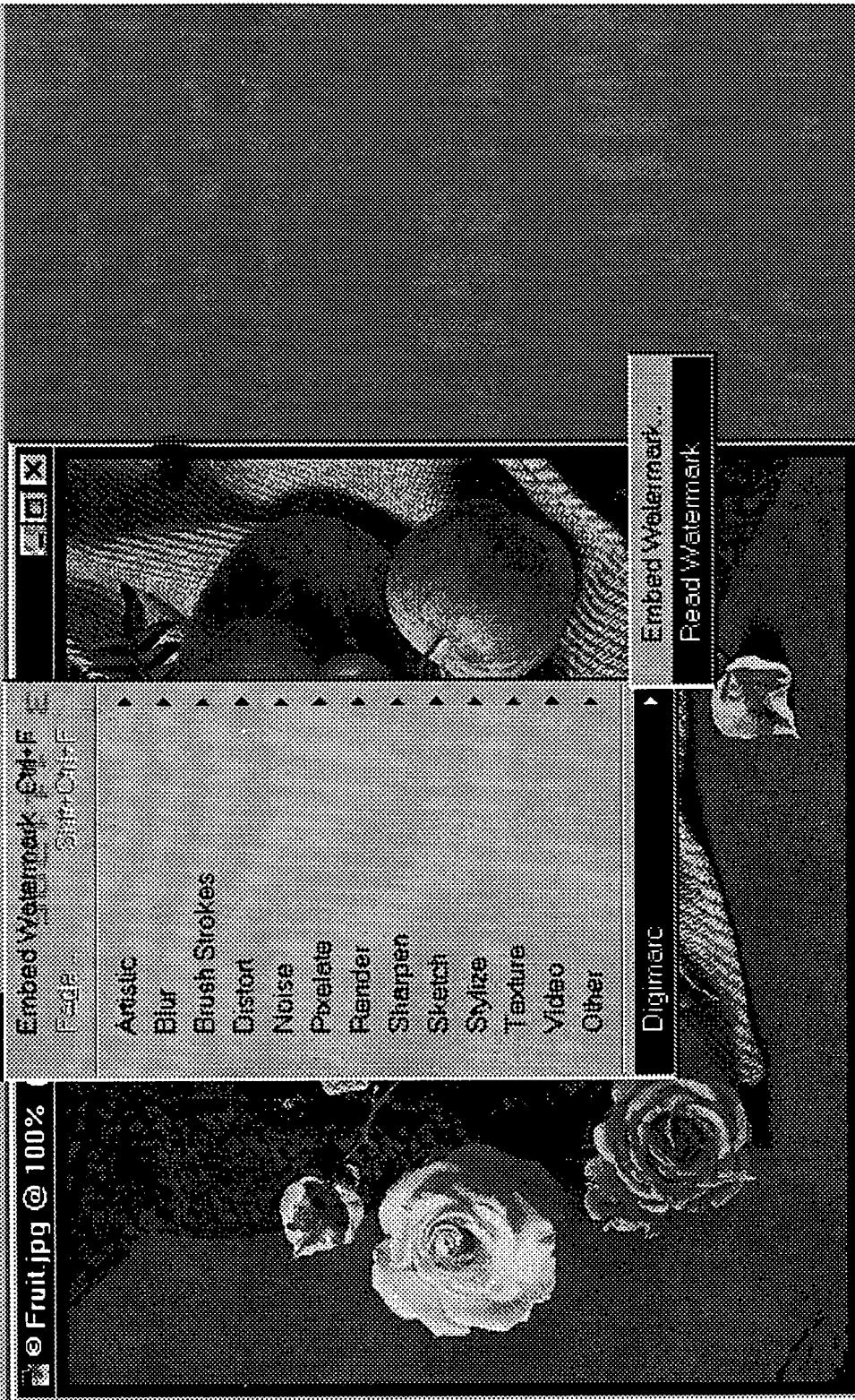
Sketch

Stylize

Texture

Video

Other



7/6, 51

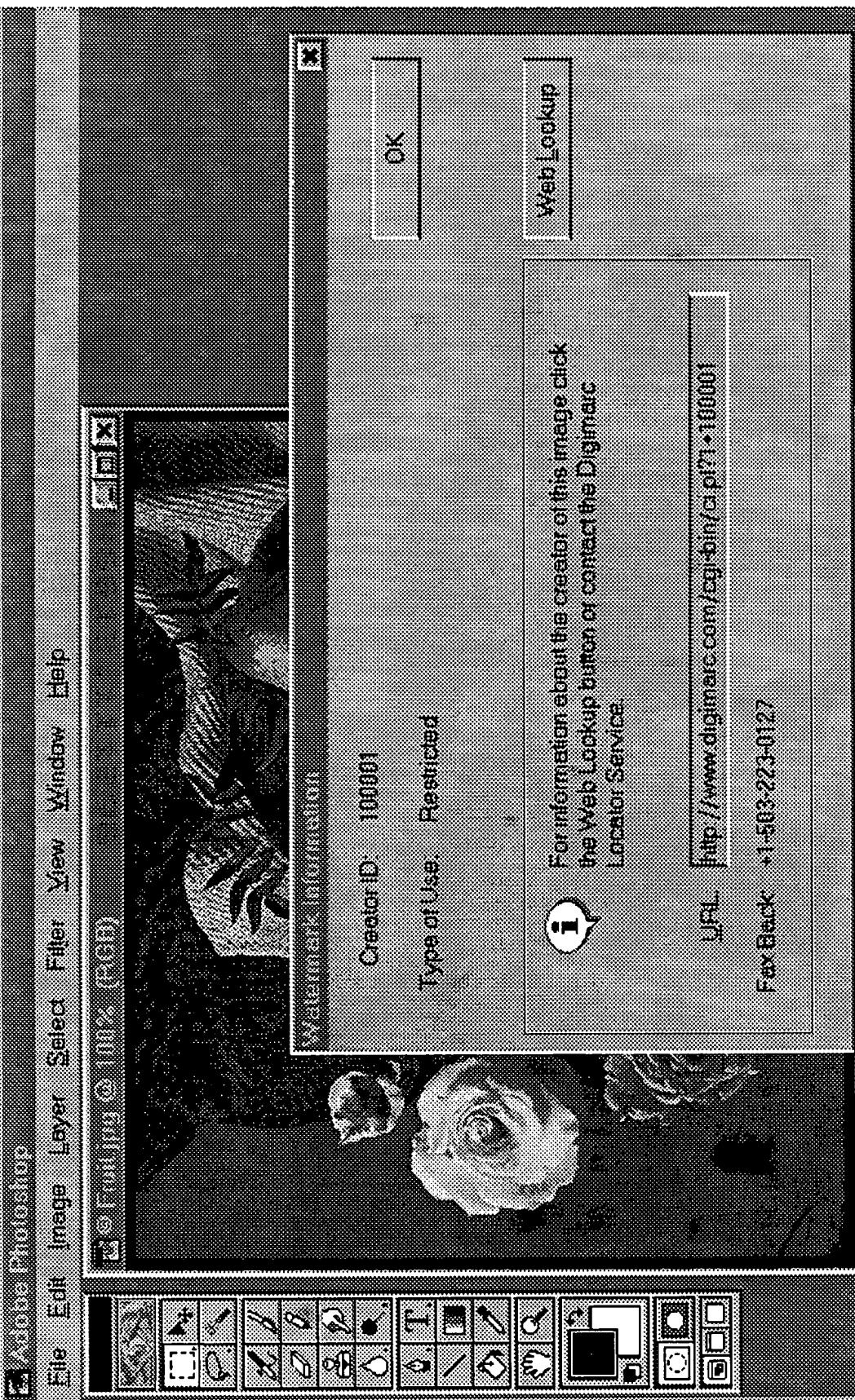
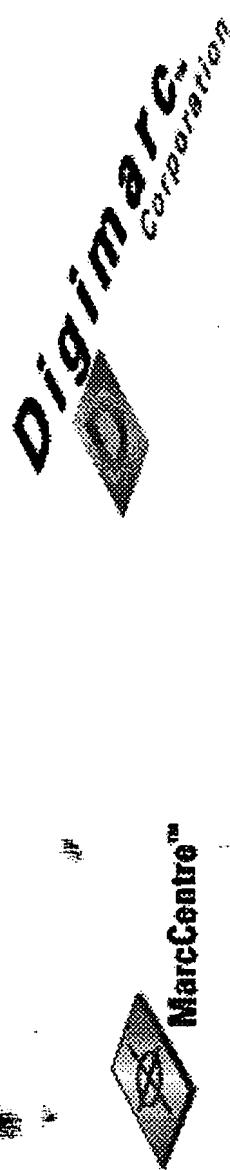
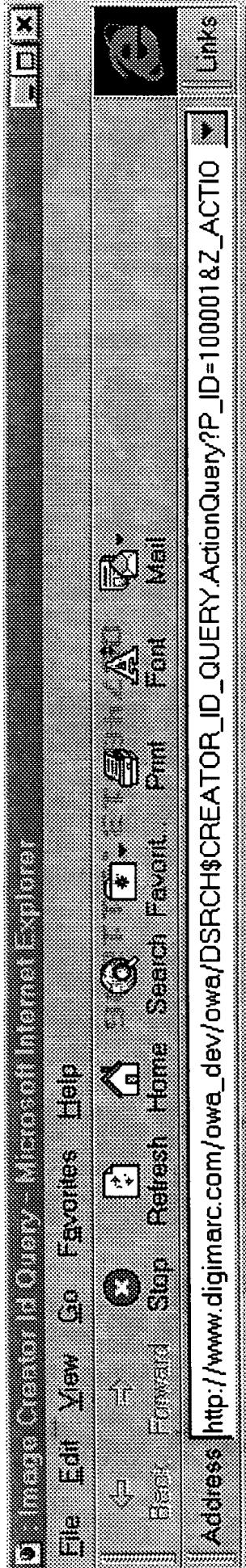


FIG. 52



Digimarc Corporation

Image Creator ID: 100001

521 SW 11th Ave, Suite 200
Portland, OR 97205
USA

Phone: 503-223-0118

E-mail: info@digimarc.com

Web: <http://www.digimarc.com>

Stock Agency or Representative.

| | | |
|---------------------------------|-------------------------------|-------------------------------|
| Creator Search | Photostop® ID | Special Offer |
| Member Services | Subscribe | Feedback |

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F16.53



MarcCentre Image Creator Search

Enter the Image Creator ID in the box below and press "Submit Search". If it is a valid ID, the contact information details will be listed.

Image Creator ID:

Submit Search

If you want to search for specific image creators by a variety of criteria such as last name, specialty, city and/or state then press the "General Search" button below.

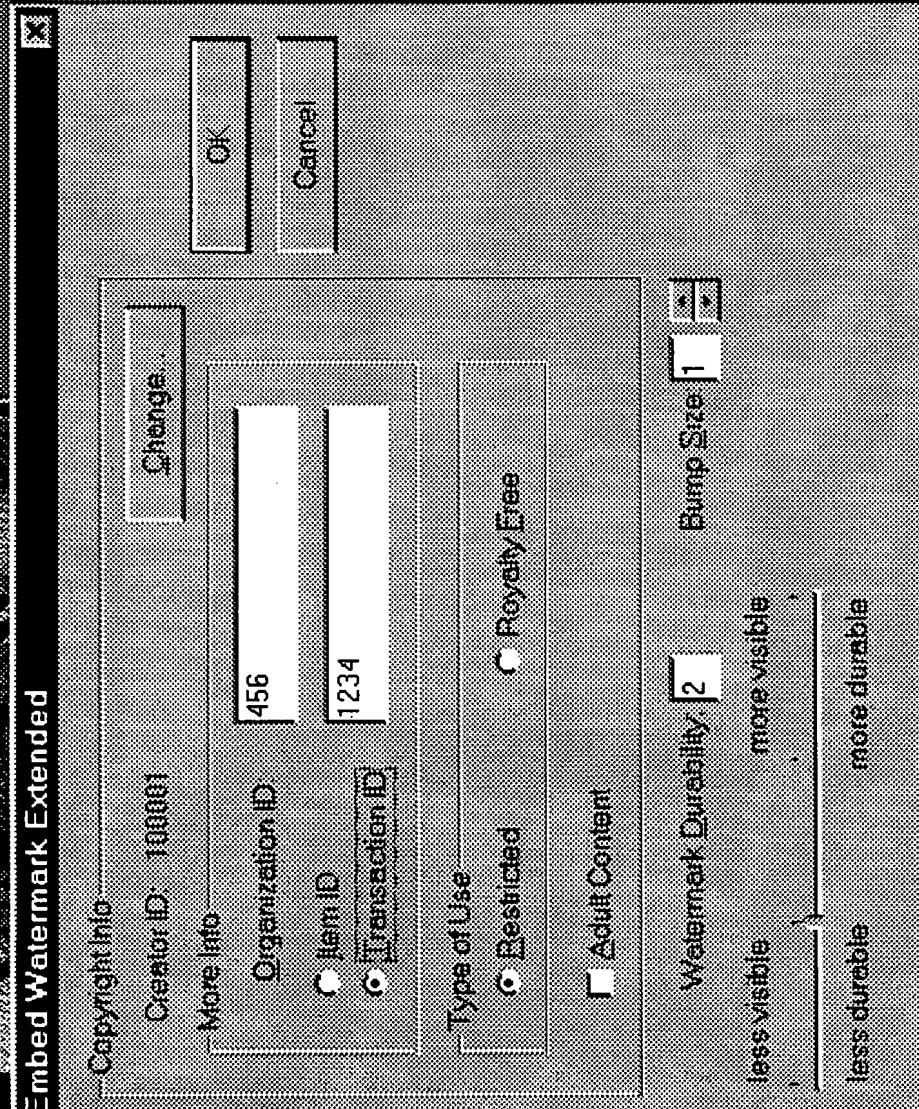
General Search

| | | | |
|--------------------|-------------------------|----------------|----------------------|
| Creator Search | Photoshop® 4.0 Offer | Special Offers | Digimarc Products |
| Member Services | Subscribe | Feedback | Logout Home |

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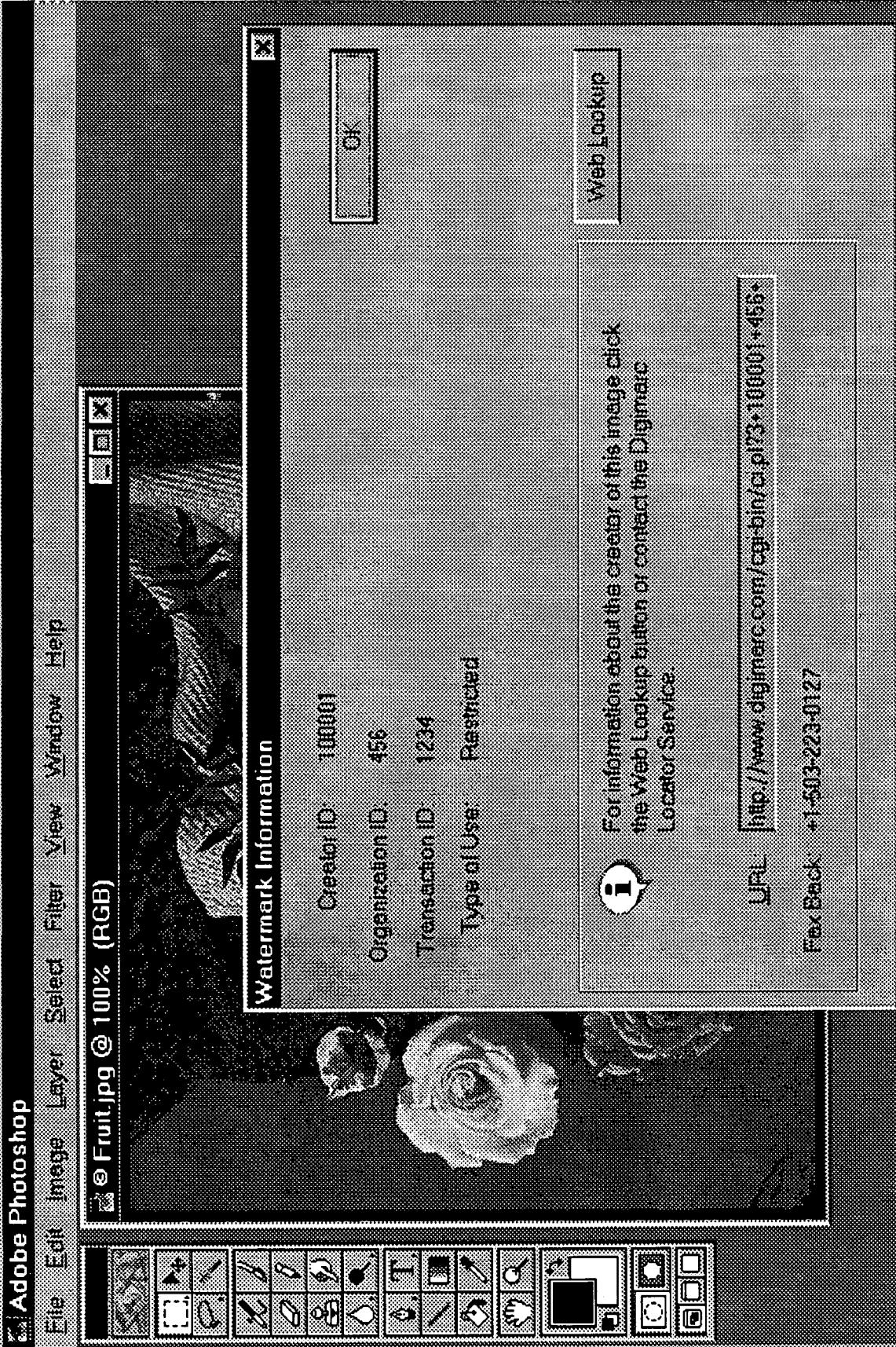
09245612-44296

FIG. 54

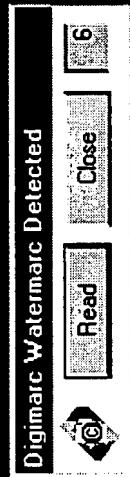
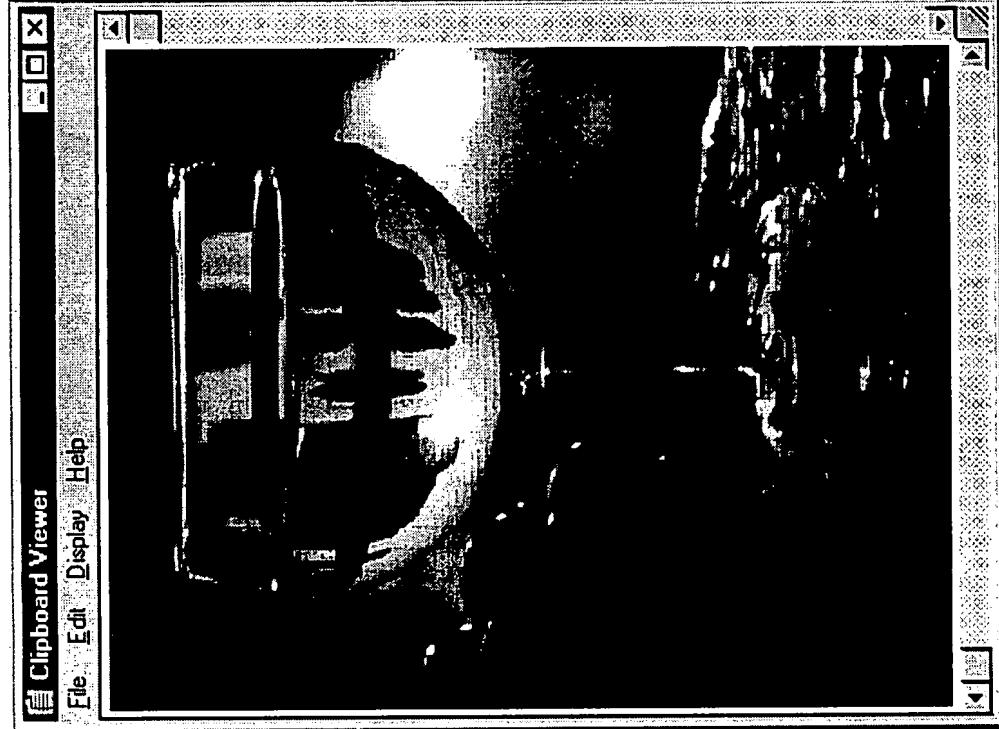


F16, S5

Adobe Photoshop



F16 56

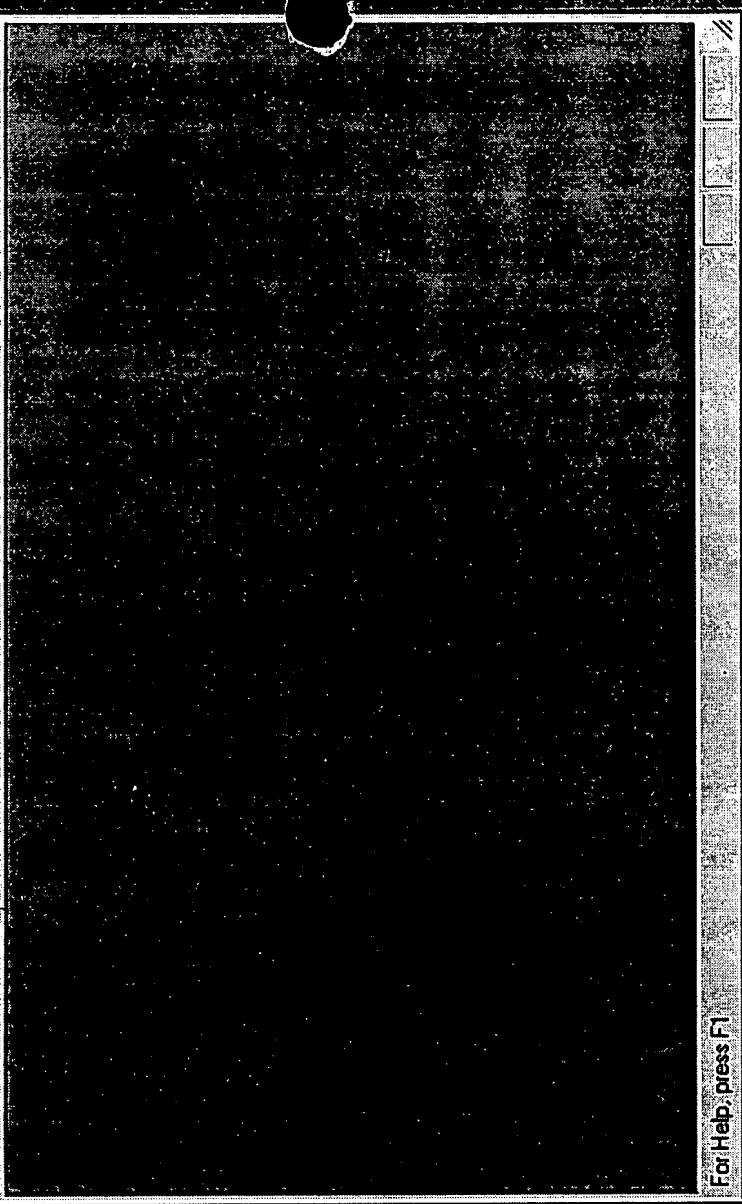
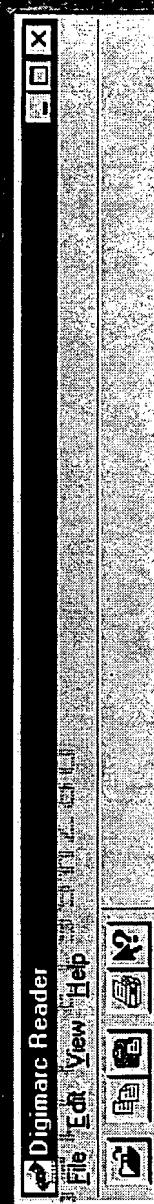


Clipboard Viewer
Digimarc Watermark Detected

Start Clipboard Viewer
Digimarc Watermark Detected

12:38 PM

771 C7



Start Clipboard Viewer

5/11 00

12:37 PM

